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SPECIFICATION FOR TUBULAR STEEL POLES FOR OVERHEAD POWER LINES

(Second Revision)

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Indian Standard
SPECIFICATION FOR TUBULAR STEEL POLES FOR OVERHEAD POWER LINES
(Second Revision)

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AMENDMENT NO. 1 SEPTEMBER 1986
TO
IS : 2713 (Parts 1 TO 3) - 1980 SPECIFICATION FOR TUBULAR STEEL POLES FOR OVERHEAD POWER LINES

PART 1 GENERAL REQUIREMENTS

(Second Revision)

(*Page* 4, *clause* **5**) — Substitute the following for the existing clause:

"**5. MANUFACTURE**

5.1 Tubes for manufacturing poles shall conform to Grade YSt 240 or YSt 310 of IS : 1161-1979 'Specification for steel tubes for structural purposes (*third revision*)', as appropriate. Manual metal arc welding process may also be used to make tubes provided tubes so manufactured shall meet all the requirements of IS : 1161-1979. Cold bend test need not be carried out for tubes manufactured by manual metal arc welding.

5.1.1 For chemical test each coil of sheet/strip used for manufacturing tubes shall be tested for phosphorus and sulphur.

5.1.2 For mechanical tests tubes shall be sampled in accordance with IS : 4711-1974 'Methods of sampling of steel pipes, tubes and fittings (*first revision*)' depending on the number of tubes in the lot to be inspected."

(*Page* 5, *clause* **8.4**) — Substitute the following for existing clause:

'**8.4** The mean weight for bulk supplies shall be within 92·5 percent of its calculated value. The weight of any single pole shall not fall below the nominal weights as given in Part 2 and Part 3 of the standard by more than 10 percent.'

(*Page* 5, *clause* **10.1**) — Delete '(a) Tensile test .. . and phosphorus' and renumber (b), (c) and (d) as (a), (b) and (c).

(*Page* 5, *clause* **10.1.1**) — Delete.

(*Page* 5, *clause* **10.1.2**) — Renumber it as **10.1.1**.

(*Page* 6 *clauses* **10.1.3**, **10.1.4** *and* **10.1.5**) — Renumber these as **10.1.2**, **10.1.3** and **10.1.4** respectively.

(*Page* 6, *clause* **10.2**) — Substitute the following for the existing formula:

$$`\frac{1}{2l_3}\left[W_1\left\{H^2-\left(l_3-l_1-J_1\right)^2\right\}+W_2\left\{\left(l_3-l_1\right)^2-\left(l_3-l_2-J_2\right)^2\right\}+W_3\left(l_3-l_2\right)^2\right]'.$$

(*Page* 6, *clause* **13.1**) — Delete the word 'throughout' from the third line.

(*Page* 8, *Tabular matter of Fig.* 4, *column heading D*) — Bracketed wording '(Outside Dia of Bottom Plate)' may be read under 'A'.

(*Page* 8, *clause* **A-1.1**) — Substitute the letter symbol '*P*', *for* '*p*' and read as under:

> "*P* - Wind pressure on flat surfaces in N/m^2, to be calculated in accordance with the provisions of IS : 875-1964 'Code of practice for structural safety of buildings: Loading Standards (*revised*) (With Amendment No. 1)'."

[*Page* 9, *clause* **A-3.1**, (*line* 7)] — Delete '*h*' from the formula '$\frac{2}{3}\,\frac{pnsdh}{100}$ N'.

[*Page* 9, *clause* **A-3.2** (*lines* 4, 7 *and* 9)] — Substitute '*p*' for '*P*' in the formulae.

(*Page* 9, *foot-note*) — Substitute the following for the existing value:

'1 Newton (N) = 0·102 kgf.
1 kgf = 9·81 N.'

(*Page* 9, *clause* **A-4.1.1**, *line* 10) — Substitute '2 180' *for* '2 220'.

(*Page* 9, *clause* **A-4.1.1**, *line* 11) — Substitute '7·2' *for* '7·3'.

(*Page* 9, *clause* **A-4.1.1**, *line* 29) — Substitute '540 TP 28' *for* '540 TP 38'.

PART 2 SPECIAL REQUIREMENTS FOR POLES MADE FROM STEEL OF TENSILE STRENGTH 410 MPa

(Second Revision)

(*Pages* 11 *to* 13, *Table* 1, *col* 9) — Substitute 'Nominal Weight of Pole' *for* 'Approx Weight of Pole'.

(*Pages* 14 *to* 16, *Table* 2, *col* 12) — Substitute 'Nominal Weight of Pole' *for* 'Approx Weight of Pole'.

(*Page* 22, *Table* 4, *col* 12, *first three items*) — Substitute '732·6', '784·5' and '864·7' *for* '7 732·6', '7 754·5' and '8 864 7' respectively.

PART 3 SPECIAL REQUIREMENTS FOR POLES MADE FROM STEEL OF TENSILE STRENGTH 540 MPa

(Second Revision)

(*Pages* 25 *to* 27, *Table* 1, *col* 9) — Substitute 'Nominal Weight of Pole' *for* 'Approx Weight of Pole'.

(*Page* 26, *Table* 1, *col* 11, *against designation* 540 TP 26) — Substitute '2 180' *for* '2 810'.

(*Pages* 28 *to* 30, *Table* 2, *col* 12) — Substitute 'Nominal Weight of Pole' *for* 'Approx Weight of Pole'.

(SMDC 6)

Printed at Simco Printing Press, Delhi, India

Indian Standard

SPECIFICATION FOR TUBULAR STEEL POLES FOR OVERHEAD POWER LINES

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 30 September 1980, after the draft finalized by the Structural Sections Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first published in 1964 and was revised in 1969. In this second revision besides incorporating the Amendments No. 1 and 2, the following modifications have been effected:

a) The standard had earlier covered poles made of high strength steel only (tensile strength 540 MPa or 55 kgf/mm^2). In this revision poles made of mild steel (tensile strength 410 MPa or 42 kgf/mm^2) have also been introduced.

b) The range of pole sizes has been enlarged.

c) The strength of poles has been based on the minimum values of ultimate tensile strength of steel.

d) Reference has been made to IS : 1161-1979* for tubes used to make poles. Use of manual metal arc welding process has also been permitted for making tubes.

e) SI units of measurement have been used.

0.3 This standard has been prepared in three parts as follows for convenient usage:

Part I	General requirements
Part II	Special requirements for poles made from steel of tensile strength 410 MPa
Part III	Special requirements for poles made from steel of tensile strength 540 MPa

---

1 MPa = 0·101 972 kgf/mm^2.

*Specification for steel tubes for structural purposes (*third revision*).

Indian Standard

SPECIFICATION FOR TUBULAR STEEL POLES FOR OVERHEAD POWER LINES

PART I GENERAL REQUIREMENTS

(Second Revision)

1. SCOPE

1.1 This part covers the general requirements for tubular steel poles of circular cross section for overhead power lines.

1.2 These general requirements apply to tubular steel poles made of steels of minimum tensile strength 410 MPa and 540 MPa which are covered in Part II and III respectively of this standard.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Breaking Load — The theoretical load which would produce at ground level a stress equal to the tensile strength in the material. This is only of theoretical interest. In reality, the elastic limit of the material would be exceeded and considerable deformation would occur before this theoretical load could be applied.

2.2 Load for Permanent Set — The maximum load which may be applied without producing at the gripping and a permanent set higher than specified. The permanent set measured at the point of application of this load shall not exceed 13 mm.

2.3 Load for Temporary Deflection — The maximum load which may be applied without producing at the point of application of this load a temporary deflection exceeding 157·5 mm.

2.4 Crippling Load — The load which is just sufficient to cause crippling of the pole.

2.5 Point of Application of Load — For the purpose of definitions from **2.1** to **2.3**, the load should be applied at right angles to the axis of the pole at a point 30 cm below the top for poles of length up to and including 9 m and at a point 60 cm below the top for poles longer than 9 m. The pole should also be considered planted to specified depth.

2.6 Lot — A collection of poles of one designation manufactured by the same process under similar conditions of production and offered for inspection at a time.

2.7 Lot Size — Number of poles in a lot.

3. TYPES

3.1 Tubular steel poles shall be of the following two types:

a) Stepped, and
b) Swaged.

4. SUPPLY OF MATERIAL

4.1 The general requirements relating to the supply of the material shall be laid down in IS : 1387-1967*.

5. MANUFACTURE

5.1 The tubes for making poles shall conform to grade YSt 240 or YSt 310 of IS : 1161-1979† as appropriate, except that manual metal arc welding process may also be used to make the tubes and the cold bend test need not be carried out.

5.1.1 For mechanical tests the tubes shall be sampled in accordance with IS: 4711-1974‡, depending on the number of tubes in the lot to be inspected.

5.2 Stepped Poles — Stepped poles shall be made from one length of tube, seamless or welded, the diameter being reduced in parallel steps by passing the tubes through series of dies. Where welded tubes are used they shall have one longitudinal weld seam only.

5.3 Swaged Poles — Swaged poles shall be made of seamless or welded tubes of suitable lengths swaged and joined together. No circumferential joints shall be permitted in the individual tube lengths of the poles. If welded tubes are used they shall have one longitudinal weld seam only; and the longitudinal welds shall be staggered at each swaged joint.

5.3.1 Swaging may be done by any mechanical process. The upper edge of each joint shall be chamfered off at an angle of about 45°. The upper edge need not be chamfered if a circumferential weld is to be deposited in accordance with **5.3.2**.

---

*General requirements for the supply of metallurgical materials (*first revision*).

†Specification for steel tubes for structural purposes (*third revision*).

‡Methods for sampling of steel pipes, tubes and fittings (*first revision*).

5.3.2 Unless swaging is done by special process such as rotary or longitudinal die swaging process a circumferential weld shall be deposited at the upper end of the joint (*see* Fig. 1) at a slope of approximately 45°. This circumferential weld shall be deposited only after the poles are subjected to and conforms to all the test requirements specified in this standard.

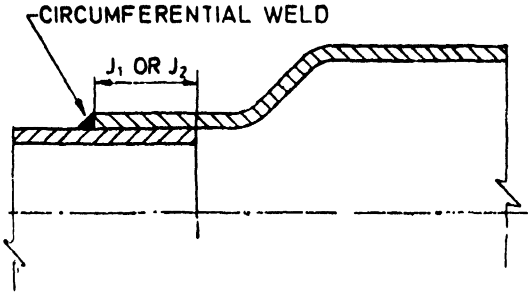


FIG. 1 CIRCUMFERENTIAL WELD IN SWAGED POLES

5.4 Joints in Swaged Poles — The lengths of joints on swaged poles shall be as follows:

Outside Diameter of Smaller Tube in Joint	*Length of Joint* (J_1 or J_2 in Fig. 1)
mm	mm
76·1	200
88·9	230
114·3	300
139·7	350
165·1	400
193·7	450

6. CHEMICAL COMPOSITION

6.1 The material, when analyzed in accordance with IS : 228 (Part III)-1972* and IS : 228 (Part IX)-1975†, shall not show sulphur and phosphorus contents of more than 0·060 percent each.

7. FREEDOM FROM DEFECTS

7.1 Poles shall be well-finished, clean and free from harmful surface defects. Ends of the poles shall be cut square. Poles shall be straight (*see* **8.5**), smooth and cylindrical.

8. TOLERANCES

8.1 Outside Diameter — The poles shall be as nearly circular as possible, and their outside diameters shall not vary from the appropriate value, except at the joint or step, by more than ±1·0 percent.

8.2 Thickness

8.2.1 In the case of welded tubes, its thickness shall not fall below the thickness specified by more than 10 percent.

8.2.2 In the case of seamless tubes, the following tolerances on thickness shall apply:

a) Where the ratio of the thickness to the outside diameter is more than 3 percent, −12·5 percent of the specified thickness; and

b) Where the ratio of the thickness to the outside diameter is equal to or less than 3 percent, −15 percent of the specified thickness.

8.3 Length — The tolerance on the length shall be as follows:

On the length of any section	±40 mm
On the overall length of pole	±25 mm

8.4 Weight — The mean weight for bulk supplies shall be not more than 5 percent below the calculated value. The weight of any single pole shall not fall below the calculated weight by more than 7·5 percent.

8.5 Straightness — The finished pole shall not be out of straightness by more than 1/600 of its length.

9. SELECTION OF POLES

9.1 In order to assist the selection of poles, a typical worked out example is given in Appendix A.

10. TESTS FOR POLES

10.1 The following tests shall be conducted on finished poles:

a) Tensile test and chemical analysis for sulphur and phosphorus,

b) Deflection test,

c) Permanent set test, and

d) Drop test.

10.1.1 Number of poles selected for conducting tensile test and chemical analysis for sulphur and phosphorus shall be as given below:

Lot Size	*No. of Poles*
Up to 500	1
501 „ 1 000	2
1 001 „ 2 000	3
2 001 „ 3 000	4
3 001 and above	5

10.1.2 Number of poles selected for conducting the deflection, permanent set and drop tests specified in **10.1** shall be as follows:

Lot Size	*No. of Poles*
Up to 500	5
501 „ 1 000	8
1 001 „ 2 000	13
2 001 „ 3 000	18
3 001 and above	20

---

*Methods of chemical analysis of steel: Part III Determination of phosphorus by alkalimetric method (*second revision*).

†Methods of chemical analysis of steel: Part IX Determination of sulphur in plain carbon steels by evolution method (*second revision*).

The deflection, permanent set and drop test shall be conducted in succession on each of the poles selected.

10.1.3 *Deflection Test* — Each pole shall be rigidly supported for a distance from the butt end equal to the depth to which it is to be planted in the ground. It shall then be loaded, as a cantilever, and the appropriate deflection load (*see* Tables 1 to 4 of Part II, and 1 and 2 of Part III) applied, at right angles to the axis of the pole 30 cm from the top for poles up to 9 m long (overall), and 60 cm from the top for poles over 9 m (overall). For convenience in testing, the pole may be fixed horizontally and the load applied vertically. The temporary deflection due to the applied load at the point of application of load shall not exceed 157·5 mm.

10.1.4 *Permanent Set Test* — This test shall be carried out immediately after the deflection test. After application of proper load specified in Tables 1 to 4 of Part II, and 1 and 2 of Part III the permanent set measured from the zero position after the release of the appropriate applied load, at the point of application of the load, shall not exceed 13 mm.

10.1.5 *Drop Test* — This test shall be made in the case of swaged poles. The pole shall be droped vertically with butt end (bottom end) downwards, three times in succession from a height of 2 m, onto a hardwood block 150 mm thick laid on a concrete foundation. The pole shall not show any signs of telescoping or loosening of joints.

10.2 When the pole is tested horizontally and the load applied vertically, suitable allowance may be made to take account of the overhanging weight of the pole. The weight adjustment shall be calculated by the following formula:

$$\frac{1}{2l_3}\left[l_1 \{ H^2 - (l_3 - l_1 - J_1)^2 \} + W_2 \{ (l_3 - l_1)^2 - (l_3 - l_2 - J_2)^2 \} + W_3 (l_3 - l_2)^2 \right]$$

where

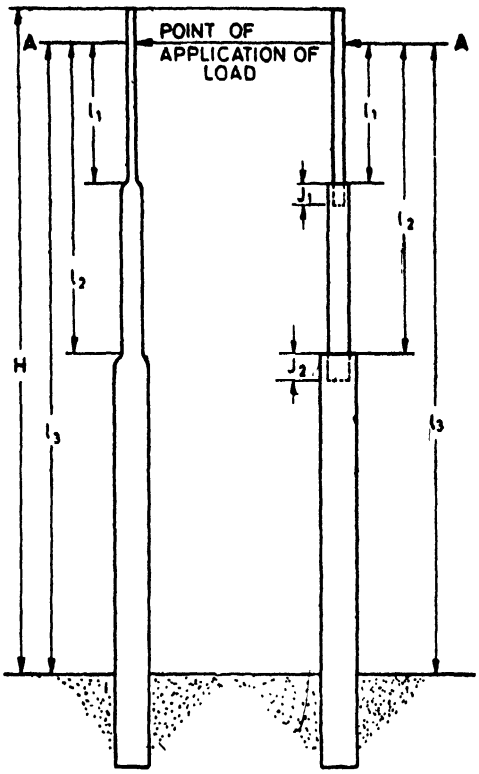
W_1, W_2, W_3 are the weights per metre of top, middle and lengths of tubes respectively. The other symbols are as shown in Fig. 2. l_1, l_2, l_3, H, J_1 and J_2 shall be expressed in metres.

11. RETESTS

11.1 Should any of the poles first selected fail to pass any of the tests specified in **10.1**, **4.1** of Part II and **4.1** of Part III two further poles shall be selected for testing from the same lot in respect of each failure. Should both these additional poles fail, the test material represented by the test samples shall be deemed as not complying with the standard.

12. WORKMANSHIP

12.1 When the tubes are made by manual metal-arc welding, the welders employed shall be qualified.



NOTE — In the case of stepped poles:

$J_1 = 0$

$J_2 = 0$

FIG. 2 TUBULAR STEEL POLES

12.2 The welded joints shall be of good quality, free from scale, surface defects, cracks, etc.

13. PROTECTION AGAINST CORROSION

13.1 Unless otherwise specified, the poles shall be coated with black bituminous paint conforming to IS : 158-1968* throughout, internally and externally, up to the level which goes inside the earth. The remaining portion of the exterior shall be painted with one coat of red oxide primer as specified in IS : 2074-1979†.

13.2 Alternatively, tubular poles (over the entire length or only certain sections) may be galvanized, subject to agreement between the supplier and the purchaser.

14. EARTHING ARRANGEMENTS

14.1 If earthing arrangements are required by the purchaser, a through hole of 14 mm diameter shall be provided in each pole at a height of 300 mm above the planting depth.

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*Specification for ready mixed paint, brushing, bituminous, black, lead-free, acid, alkali, water and heat resisting for general purposes (*second revision*).

†Specification for ready mixed paint, red oxide-zinc chrome, priming (*first revision*).

15. FINIALS AND BASE PLATES

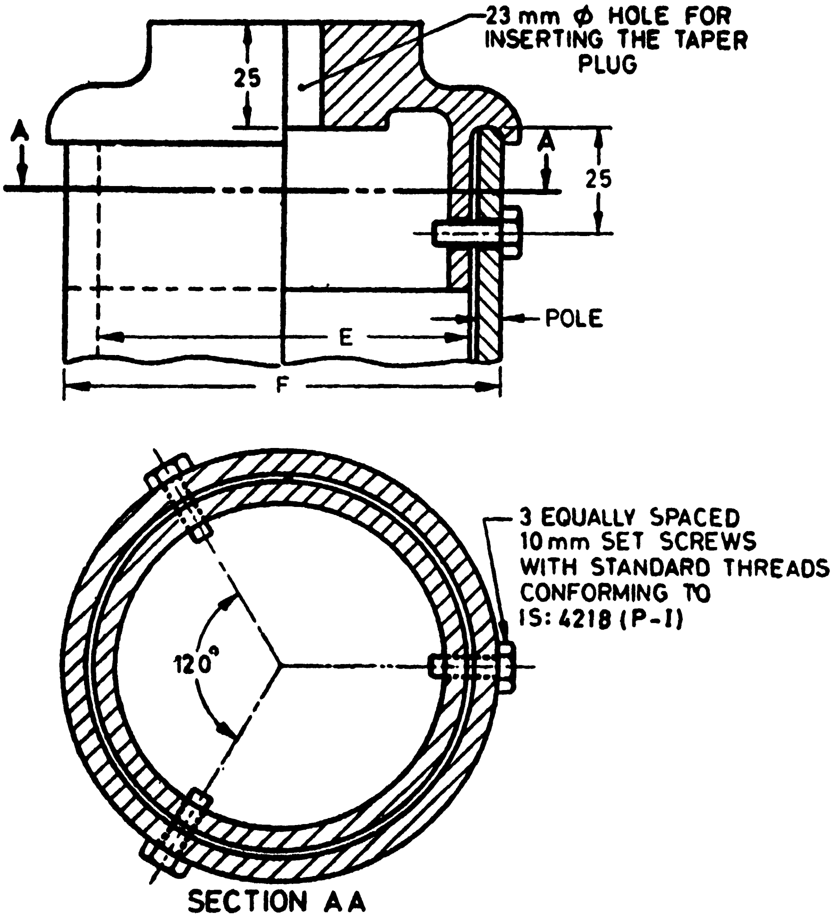
15.1 It is recommended that finials, base plates and taper plugs shall be according to the details given in Fig. 3 and 4.

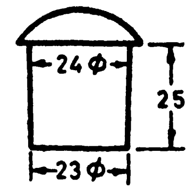
16. MARKING

16.1 Unless otherwise specified the poles shall be marked with designation, manufacturer's identification and the year of manufacture.

16.2 The poles may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.


23 mm ϕ HOLE FOR INSERTING THE TAPER PLUG
25
A
A
25
POLE
E
F
3 EQUALLY SPACED 10 mm SET SCREWS WITH STANDARD THREADS CONFORMING TO IS: 4218 (P-I)
120°
SECTION AA



CAST IRON OR MILD STEEL TAPER PLUG

Details of Finials

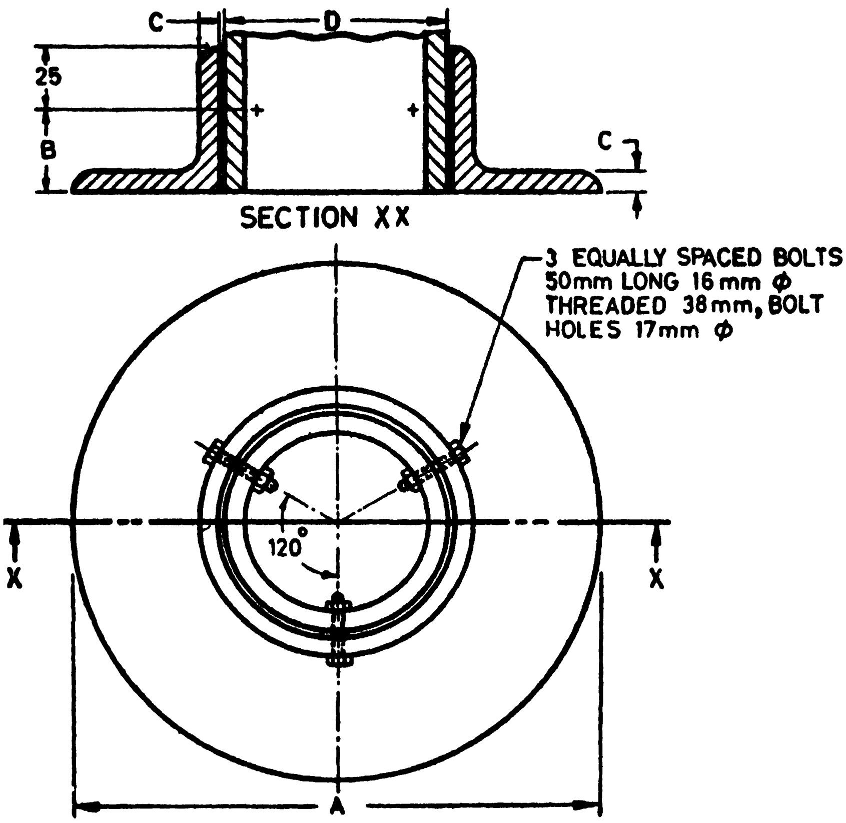
F (Outside Dia of Top Pole)	E
76·1	62
88·9	75
114·3	100
139·7	125
193·7	180

NOTE 1 — Holes in the pole are not tapped.

NOTE 2 — Holes in the finial to be tapped to suit screws.

All dimensions in millimetres.

FIG. 3 FINIAL


C
D
25
B
C
SECTION XX
3 EQUALLY SPACED BOLTS 50mm LONG 16mm ϕ THREADED 38mm, BOLT HOLES 17mm ϕ
120°
X
X
A

Details of Base Plate

D (Outside Dia of Bottom Plate)	C	B	A
114·3	15	45	290
139·7	15	45	340
152·4	15	45	350
165·1	20	45	400
193·7	20	45	460
219·1	20	45	500
244·5	20	45	550

All dimensions in millimetres.

Fig. 4 Cast Iron Base Plate

APPENDIX A

(*Clause* 9.1)

SELECTION OF POLES

A-0. GENERAL

A-0.1 The example given in this appendix is intended to illustrate the selection of a pole for a particular situation.

A-1. SYMBOLS

A-1.1 Letter symbols used in this appendix (*see* Figures in Tables 3 and 4 of Part II) are given below:

$A\text{-}A$ = Line of application of resultant of wind loads on wires and pole

H = Overall height above ground in metres

l_1, l_2, l_3 = Distance in metres from $A\text{-}A$ to bottom of each section (in case of bottom section, it is up to GL only)

D_1, D_2, D_3 = Outside diameter of top, middle and bottom sections of pole in centimetres

p = Wind pressure on flat surface in newtons per square metre

h = Height of conductors on cross arm from GL in metres

n = Number of conductors

d = Diameter of conductors in centimetres

s = Sum of half the spans on each side of pole in metres

P_1 = Equivalent wind load on pole, calculated as acting at $A\text{-}A$

P_2 = Equivalent wind load on conductors calculated as acting at $A\text{-}A$

P = Total wind load as acting at $A\text{-}A = P_1 + P_2$ in newtons

GL = Ground level

BM = Bending moment

Note — When the overall length, the depth to which the pole is to be planted, the number and disposition of the wires, the wind pressure and factor of safety to be allowed for, have been decided; the dimensions of the pole suitable for the given working conditions for tangent or straight line locations may be readily calculated.

A-2. SUBSCRIPTS

A-2.1 Letters with subscript 1, 2 or 3 refer respectively to the top, middle and bottom sections of the pole.

A-3. WIND LOAD

A-3.1 First the load on the wires is calculated by multiplying the wind pressure by the diameter of each wire, by the length of the span and the result by 2/3 to allow for circular section. Then the equivalent load acting at *A-A* can be calculated as follows:

$$\text{Wind load on conductors} = \tfrac{2}{3}\frac{pnsdh}{100}\ \text{N, acting at } h \text{ metres from } GL$$

$$BM \text{ due to wind load at } GL = \tfrac{2}{3}\frac{pnsdh}{100}\ \text{N.m}$$

$$\text{Equivalent load acting at } A\text{-}A = \tfrac{2}{3}\frac{pnsdh}{100\,l_3}\ \text{N}$$

$$\text{Therefore, } P_2 = \frac{pnsdh}{150\,l_3}\ \text{N}$$

A-3.2 The wind load on pole is next calculated and expressed as the equivalent load acting at the same point as the load imposed by wires.

$$\text{Wind load on pole} = \frac{PD_1}{100}[H - (l_3 - l_1)]\tfrac{2}{3}, \text{ acting at a distance of } H - \frac{H - (l_3 - l_1)}{2} \text{ from } GL$$

$$+ \frac{PD_2}{100}(l_2 - l_1)\tfrac{2}{3}, \text{ acting at a distance of } \left[(l_3 - l_2) + \frac{l_2 - l_1}{2}\right] \text{ from } GL$$

$$+ \frac{PD_3}{100}(l_3 - l_2)\tfrac{2}{3}, \text{ acting at a distance of } \frac{l_3 - l_2}{2} \text{ from } GL$$

$$BM \text{ due to wind on pole at } GL = \tfrac{2}{3}p/100\left[D_1\{H - (l_3 - l_1)\}\left\{H - \frac{H - (l_3 - l_1)}{2}\right\} + D_2(l_2 - l_1)(l_3 - \tfrac{1}{2}l_1 - \tfrac{1}{2}l_2) + D_3(l_3 - l_2)\frac{l_3 - l_2}{2}\right]\text{N.m}$$

say WM

$$\text{Equivalent load acting at } A\text{-}A = P_1 = \frac{WM}{l_3}$$

$$\text{So, total load } P = (P_1 + P_2)\ \text{N}$$

A-3.3 The selection of poles shall be made from Tables 1 and 2 of Part II and part III for high strength poles and from Tables 3 and 4 of Part II for mild steel poles.

A-3.4 It is not possible to calculate the pole dimensions directly because they depend on the total wind load, which includes both the wind load on the wires and that on the pole itself, while the wind load on poles obviously depends upon process of trial and error.

A-4. EXAMPLE

A-4.1 Required to select a suitable pole to carry three-phase conductors of diameter 7·10 mm and one neutral conductor of diameter 4·50 mm on one cross arm in spans of 80 m, the mean height of conductors above *GL* being 7·0 m. Wind pressure is 1 000 Pa (approximately 100 kgf/m²).

A-4.1.1 *Calculation*

$$\text{Wind pressure} = 1\,000\ \text{Pa}\ (100\ \text{kgf/m}^2)$$

$$\text{Wind load on wires} = \left(1\,000 \times 3 \times \frac{0{\cdot}71}{100} \times 80 \times \frac{2}{3}\right) + \left(1\,000 \times 1 \times \frac{0{\cdot}45}{100} \times 80 \times \frac{2}{3}\right)$$

$$= 1\,140 + 240 = 1\,380\ \text{N (138 kgf) at 7 m from } GL.$$

For a mean height of 7 m of the conductors, a 9 m pole is suitable.

For 540 TP 26 (*see* Table 1 of Part III), we have step lengths as 4·8 × 2·1 × 2·1 m, the diameter of steps as 114·3 × 88·9 × 76·1 mm and a crippling load of 2 220 N. This pole has planting depth of 1·5 m and *A-A* is 0·3 m from top or 7·3 m from *GL*.

Therefore, wind load on wires calculated as above and when transferred to be acting at

$$A\text{-}A = P_2 = \frac{1\,380 \times 7}{7{\cdot}2} = 1\,340\ \text{N (134 kgf).}$$

NOTE — The cross arm is assumed at 75 cm from top and height of conductors above cross arm as 25 cm.

Load due to wind on pole after transferring it to act at *A-A*

$$= P_1 = \frac{1\,000}{150 \times 7{\cdot}2}\left[7{\cdot}6\{7{\cdot}5 - (7{\cdot}2 - 1{\cdot}8)\}\left\{7{\cdot}5 - \frac{7{\cdot}5 - (7{\cdot}2 - 1{\cdot}8)}{2}\right\} + 88{\cdot}9(3{\cdot}9 - 1{\cdot}8)\left(7{\cdot}2 - \frac{1{\cdot}8}{2} - \frac{3{\cdot}9}{2}\right) + \frac{11{\cdot}43(7{\cdot}2 - 3{\cdot}9)^2}{2}\right]$$

$$= 230\ \text{N (22·8 kgf).}$$

Total load $P = 230 + 1\,340 = 1\,570$ N (156·8 kgf).

Assuming a factor of safety of 2·0 based on crippling load according to Indian Electricity Rules, 1956, the working load of pole selected should not exceed $\frac{2\,220{\cdot}0}{2{\cdot}0} = 1\,110$ N.

Therefore, this pole is not suitable.

Taking the next pole, 540 TP 38, we have the diameter of steps as 139·7 × 114·3 × 88·9 mm and crippling load as 3 320 N (339 kgf) the rest of the data remaining the same.

Wind load on wires transferred to be acting at *A-A* remained the same, namely, 1 340 N. Load due to wind on pole after transferring it to act at *A-A*

$$= P_1 = \frac{1\,000}{150 \times 7{\cdot}2}\left[8{\cdot}89\{7{\cdot}5 - (7{\cdot}2 - 1{\cdot}8)\}\left\{7{\cdot}5\ \frac{7{\cdot}5 - (7{\cdot}2 - 1{\cdot}8)}{2}\right\} + 11{\cdot}43(3{\cdot}9 - 1{\cdot}8)\left(7{\cdot}2 - \frac{1{\cdot}8}{2} - \frac{3{\cdot}9}{2}\right) + \frac{13{\cdot}97(7{\cdot}2 - 3{\cdot}9)^2}{2}\right] = 300\ \text{N}$$

Total load $P = 300 + 1\,340 = 1\,640$ N.

Assuming a factor of safety of 2·0 based on crippling load as above, the working load of pole selected should not exceed $\frac{3\,320}{2} = 1\,660$ N.

Hence this pole is suitable.

Similarly it will be found that 540 SP 28 will be suitable.

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1 Newton (N) = 0·665 kgf.
1 kgf = 10·197 2 N.

Indian Standard

SPECIFICATION FOR TUBULAR STEEL POLES FOR OVERHEAD POWER LINES

PART II SPECIAL REQUIREMENTS FOR POLES MADE FROM STEEL OF TENSILE STRENGTH 410 MPa

(Second Revision)

1. SCOPE

1.1 This part covers the requirements for tubular steel poles of circular cross section made from steel of minimum tensile strength 410 MPa for overhead power lines. The general requirements are covered in Part I.

2. DESIGNATION

2.1 Tubular steel stepped and swaged poles conforming to this standard (Part II) shall be designated as 410 TP and 410 SP respectively, followed by serial number as shown in col 1 of Tables 1 and 2.

Example: 410 SP 15—IS:2713 (Parts I and II)-1980.

3. TUBES FOR THE MANUFACTURE OF POLES

3.1 The tubes for making poles shall conform to grade YSt 240 of IS : 1161-1979[*] except that:

a) manual metal arc welding process may also be used to manufacture tubes, and

b) cold bend test need not be conducted.

3.1.1 For material test the tubes shall be sampled as per IS: 4711-1974[*] depending on the number of tubes in the lot to be inspected.

4. PHYSICAL REQUIREMENTS OF THE FINISHED POLES

4.1 The steel sample obtained from the finished pole when tested in accordance with IS : 1894-1972[†] shall show a minimum tensile strength of 410 MPa (42·0 kgf/mm^2) and a minimum percentage elongation specified in **10.1.1** and **10.1.1.1** of IS : 1161-1979[‡].

5. DIMENSIONS AND STRUCTURAL PROPERTIES

5.1 The dimensions of poles shall be as given in Table 1 for stepped poles and Table 2 for swaged poles. Useful properties of these poles calculated on the basis of dimensions are also given in Tables 1 and 2.

5.2 A few structural properties which are useful in designing the poles are given in Tables 3 and 4.

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1 MPa = 0·10 1972 kgf/mm^2.

[*] Specification for steel tubes for structural purposes (*third revision*).

[*] Methods for sampling of steel pipes, tubes and fittings (*first revision*).

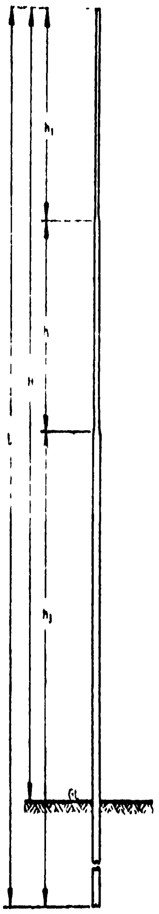
[†] Method for tensile testing of steel tubes (*first revision*).

[‡] Specification for steel tubes for structural purposes (*third revision*).

TABLE 1 STEPPED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 410 MPa (42 kgf/mm²)

(Clauses 2.1 and 5.1)

DESIGNATION	OVERALL LENGTH L	PLANTING DEPTH	LOAD APPLIED FROM TOP AT A DISTANCE	HEIGHT ABOVE GROUND H	WALL THICKNESS	STEPS $h_3 \times h_2 \times h_1$	OUTSIDE DIAMETER OF STEPS	APPROX WEIGHT OF POLE	BREAKING LOAD	CRIPPLING LOAD	WORKING LOAD: Crippling Load 2	WORKING LOAD: Breaking Load 2·5	LOAD FOR PERMANENT SET NOT EXCEEDING 13 mm	LOAD FOR TEMPORARY DEFLECTION OF 157·5 mm
(1)	(2) (m)	(3) (m)	(4) (m)	(5) (m)	(6) (mm)	(7) (m)	(8) (mm)	(9) (kg)	(10) N(kgf)	(11) N(kgf)	(12) N(kgf)	(13) N(kgf)	(14) N(kgf)	(15) N(kgf)
410 TP-1	7·00	1·25	0·30	5·75	3·65	3·60×1·70×1·70	114·3× 88·9× 76·1	60	2 570 (262)	1 820 (186)	912 (93)	1 030 (105)	1 240 (127)	745 (76)
410 TP-2	7·00	1·25	0·30	5·75	4·50	3·60×1·70×1·70	114·3× 88·9× 76·1	79	3 100 (316)	2 200 (224)	1 100 (112)	1 240 (126)	1 510 (154)	902 (92)
410 TP-3	7·00	1·25	0·30	5·75	5·40	3·60×1·70×1·70	114·3× 88·9× 76·1	87	3 630 (370)	2 580 (263)	1 280 (131)	1 450 (148)	1 770 (180)	1 050 (107)
410 TP-4	7·50	1·25	0·30	6·25	3·65	4·00×1·75×1·75	114·3× 88·9× 76·1	65	2 353 (240)	1 670 (170)	834 (85)	940 (96)	1 150 (117)	598 (61)
410 TP-5	7·50	1·25	0·30	6·25	4·50	4·00×1·75×1·75	114·3× 88·9× 76·1	79	2 830 (289)	2 010 (205)	1 010 (103)	1 140 (116)	1 370 (140)	716 (73)
410 TP-6	7·50	1·25	0·30	6·25	5·40	4·00×1·75×1·75	114·3× 88·9× 76·1	94	3 320 (339)	2 360 (241)	1 180 (120)	1 330 (136)	1 620 (165)	834 (85)
410 TP-7	7·50	1·25	0·30	6·25	4·50	4·00×1·75×1·75	139·7×114·3× 88·9	97	4 330 (442)	3 080 (314)	1 540 (157)	1 740 (177)	2 120 (215)	1 380 (141)
410 TP-8	7·50	1·25	0·30	6·25	4·85	4·00×1·75×1·75	139·7×114·3× 88·9	105	4 630 (472)	3 280 (335)	1 650 (168)	1 850 (189)	2 250 (229)	1 470 (150)
410 TP-9	7·50	1·25	0·30	6·25	5·40	4·00×1·75×1·75	139·7×114·3× 88·9	116	5 100 (520)	3 620 (369)	1 810 (185)	2 040 (208)	2 480 (253)	1 630 (165)
410 TP-10	8·00	1·50	0·30	6·50	3·65	4·40×1·80×1·80	114·3× 88·9× 76·1	69	2 260 (230)	1 600 (163)	804 (82)	902 (92)	1 100 (112)	530 (54)
410 TP-11	8·00	1·50	0·30	6·50	4·50	4·40×1·80×1·80	114·3× 88·9× 76·1	88	2 730 (278)	1 930 (197)	970 (99)	1 090 (111)	1 320 (135)	647 (66)
410 TP-12	8·00	1·50	0·30	6·50	5·40	4·40×1·80×1·80	114·3× 88·9× 76·1	101	3 190 (325)	2 260 (231)	1 130 (115)	1 270 (130)	1 550 (158)	745 (76)
410 TP-13	8·00	1·50	0·30	6·50	4·50	4·40×1·80×1·80	139·7×114·3× 88·9	101	4 160 (424)	2 950 (301)	1 480 (151)	1 670 (170)	2 020 (206)	1 230 (125)
410 TP-14	8·00	1·50	0·30	6·50	4·85	4·40×1·80×1·80	139·7×114·3× 88·9	113	4 440 (453)	3 160 (322)	1 580 (161)	1 780 (181)	2 160 (220)	1 300 (133)
410 TP-15	8·00	1·50	0·30	6·50	5·40	4·40×1·80×1·80	139·7×114·3× 88·9	125	4 890 (499)	3 470 (354)	1 740 (177)	1 960 (200)	2 380 (243)	1 440 (147)
410 TP-16	8·50	1·50	0·30	7·00	3·65	4·50×2·00×2·00	114·3× 88·9× 76·1	73	2 090 (213)	1 480 (151)	745 (76)	834 (85)	1 020 (104)	412 (42)
410 TP-17	8·50	1·50	0·30	7·00	4·50	4·50×2·00×2·00	114·3× 88·9× 76·1	89	2 520 (257)	1 780 (182)	892 (91)	1 010 (103)	1 230 (125)	49 (50)
410 TP-18	8·50	1·50	0·30	7·00	5·40	4·50×2·00×2·00	114·3× 88·9× 76·1	106	2 950 (301)	2 100 (214)	1 050 (107)	1 180 (120)	1 430 (146)	579 (59)
410 TP-19	8·50	1·50	0·30	7·00	4·50	4·50×2·00×2·00	139·7×114·3× 88·9	110	3 840 (392)	2 730 (278)	1 360 (139)	1 540 (157)	1 870 (191)	951 (97)
410 TP-20	8·50	1·50	0·30	7·00	4·85	4·50×2·00×2·00	139·7×114·3× 88·9	119	4 110 (419)	2 920 (298)	1 460 (149)	1 650 (158)	2 000 (204)	1 020 (104)
410 TP-21	8·50	1·50	0·30	7·00	5·40	4·50×2·00×2·00	139·7×114·3× 88·9	132	4 530 (462)	3 220 (328)	1 610 (164)	1 810 (185)	2 210 (225)	1 120 (114)
410 TP-22	8·50	1·50	0·30	7·00	4·50	4·50×2·00×2·00	165·1×139·7×114·3	134	5 450 (556)	3 870 (395)	1 940 (197)	2 180 (222)	2 350 (240)	1 660 (169)
410 TP-23	8·50	1·50	0·30	7·00	4·85	4·50×2·00×2·00	165·1×139·7×114·3	145	5 840 (596)	4 150 (423)	2 080 (212)	2 330 (238)	2 840 (290)	1 770 (181)
410 TP-24	8·50	1·50	0·30	7·00	5·40	4·50×2·00×2·00	165·1×139·7×114·3	160	6 450 (658)	4 580 (467)	2 290 (234)	2 580 (263)	3 140 (320)	1 950 (199)
410 TP-25	9·00	1·50	0·30	7·50	3·65	4·80×2·10×2·10	114·3× 88·9× 76·1	78	1 940 (198)	1 380 (141)	686 (70)	775 (79)	941 (96)	333 (34)
410 TP-26	9·00	1·50	0·30	7·50	4·50	4·80×2·10×2·10	114·3× 88·9× 76·1	94	2 340 (239)	1 670 (170)	834 (85)	941 (96)	1 140 (116)	402 (41)
410 TP-27	9·00	1·50	0·30	7·50	5·40	4·80×2·10×2·10	114·3× 88·9× 76·1	113	2 750 (280)	1 950 (199)	971 (99)	1 100 (112)	1 330 (136)	471 (48)
410 TP-28	9·00	1·50	0·30	7·50	4·50	4·80×2·10×2·10	139·7×114·3× 88·9	117	3 580 (365)	2 540 (259)	1 270 (130)	1 430 (146)	1 740 (177)	775 (79)



1 kg = 9·806 65 N.

(Continued)

TABLE 1 STEPPED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 410 MPa (42 kgf/mm²) — *Contd*

DESIGNATION	OVERALL LENGTH L	PLANTING DEPTH	LOAD APPLIED FROM TOP AT A DISTANCE	HEIGHT ABOVE GROUND H	WALL THICKNESS	STEPS $h_3 \times h_2 \times h_1$	OUTSIDE DIAMETER OF STEPS	APPROX WEIGHT OF POLE	BREAKING LOAD	CRIPPLING LOAD	WORKING LOAD: Crippling Load 2	WORKING LOAD: Breaking Load 2·5	LOAD FOR PERMANENT SET NOT EXCEEDING 13 mm	LOAD FOR TEMPORARY DEFLECTION OF 157·5 mm
(1)	(2) (m)	(3) (m)	(4) (m)	(5) (m)	(6) (mm)	(7) (m)	(8) (mm)	(9) (kg)	(10) N(kgf)	(11) N(kgf)	(12) N(kgf)	(13) N(kgf)	(14) N(kgf)	(15) N(kgf)
410 TP-29	9·00	1·50	0·30	7·50	4·85	4·80×2·10×2·10	139·7×114·3× 88·9	126	3 820 (390)	2 720 (277)	2 330 (238)	1 530 (156)	1 860 (190)	824 (84)
410 TP-30	9·00	1·50	0·30	7·50	5·40	4·80×2·10×2·10	139·7×114·3× 88·9	140	4 220 (430)	2 990 (305)	1 500 (153)	1 690 (172)	2 050 (209)	912 (93)
410 TP-31	9·00	1·50	0·30	7·50	4·50	4·80×2·10×2·10	165·1×139·7×114·3	142	5 070 (517)	3 600 (367)	1 800 (184)	2 030 (207)	2 460 (251)	1 340 (137)
410 TP-32	9·00	1·50	0·30	7·50	4·85	4·80×2·10×2·10	165·1×139·7×114·3	154	5 430 (554)	3 850 (393)	1 930 (197)	2 180 (222)	2 640 (269)	1 440 (147)
410 TP-33	9·00	1·50	0·30	7·50	5·40	4·80×2·10×2·10	165·1×139·7×114·3	170	6 000 (612)	4 270 (435)	2 130 (217)	2 400 (245)	2 510 (297)	1 590 (162)
410 TP-34	9·50	1·80	0·60	7·70	4·50	4·90×2·30×2·30	139·7×114·3× 88·9	122	3 630 (370)	2 580 (263)	1 280 (131)	1 450 (148)	1 770 (180)	745 (76)
410 TP-35	9·50	1·80	0·60	7·70	4·85	4·90×2·30×2·30	139·7×114·3× 88·9	133	3 880 (396)	2 760 (281)	1 380 (141)	1 550 (158)	1 880 (192)	794 (81)
410 TP-36	9·50	1·80	0·60	7·70	5·40	4·90×2·30×2·30	139·7×114·3× 88·9	147	4 280 (436)	3 040 (310)	1 520 (155)	1 710 (174)	2 080 (212)	883 (90)
410 TP-37	9·50	1·80	0·60	7·70	4·50	4·90×2·30×2·30	165·1×139·7×114·3	149	5 150 (525)	3 600 (373)	1 820 (186)	2 060 (210)	2 500 (255)	1 300 (133)
410 TP-38	9·50	1·80	0·60	7·70	4·85	4·90×2·30×2·30	165·1×139·7×114·3	161	5 510 (562)	3 910 (399)	1 960 (200)	2 210 (225)	2 680 (273)	1 390 (142)
410 TP-39	9·50	1·80	0·60	7·70	5·40	4·90×2·30×2·30	165·1×139·7×114·3	178	6 090 (621)	4 320 (441)	2 160 (220)	2 430 (248)	2 960 (302)	1 540 (157)
410 TP-40	10·00	1·80	0·60	8·20	4·50	5·20×2·40×2·40	139·7×114·3× 88·9	129	3 390 (346)	2 410 (246)	1 210 (123)	1 350 (138)	1 650 (168)	618 (63)
410 TP-41	10·00	1·80	0·60	8·20	4·85	5·20×2·40×2·40	139·7×114·3× 88·9	140	3 630 (370)	2 580 (263)	1 280 (131)	1 450 (148)	1 770 (180)	686 (70)
410 TP-42	10·00	1·80	0·60	8·20	5·40	5·20×2·40×2·40	139·7×114·3× 88·9	155	3 900 (407)	2 930 (299)	1 410 (144)	1 600 (163)	1 940 (198)	725 (74)
410 TP-43	10·00	1·80	0·60	8·20	4·50	5·20×2·40×2·40	165·1×139·7×114·3	157	4 800 (490)	3 410 (348)	1 710 (174)	1 920 (196)	2 330 (238)	1 070 (109)
410 TP-44	10·00	1·80	0·60	8·20	4·85	5·20×2·40×2·40	165·1×139·7×114·3	170	5 150 (525)	3 660 (373)	1 820 (186)	2 060 (210)	2 500 (255)	1 150 (117)
410 TP-45	10·00	1·80	0·60	8·20	5·40	5·20×2·40×2·40	165·1×139·7×114·3	188	5 690 (580)	4 040 (412)	2 020 (206)	2 280 (232)	2 770 (282)	1 260 (128)
410 TP-46	10·00	1·80	0·60	8·20	4·85	5·20×2·40×2·40	193·7×165·1×139·7	202	7 210 (735)	5 120 (522)	2 560 (261)	2 880 (294)	3 510 (357)	1 890 (193)
410 TP-47	10·00	1·80	0·60	8·20	5·40	5·20×2·40×2·40	193·7×165·1×139·7	224	7 910 (807)	5 620 (57[illegible])	2 800 (286)	3 170 (323)	3 840 (392)	2 090 (213)
410 TP-48	10·00	1·80	0·60	8·20	5·90	5·20×2·40×2·40	193·7×165·1×139·7	244	8 620 (879)	6 120 (624)	3 060 (312)	3 450 (352)	4 190 (427)	2 260 (231)
410 TP-49	11·00	1·80	0·60	9·20	4·50	5·60×2·70×2·70	139·7×114·3× 88·9	141	3 000 (306)	2 130 (217)	1 070 (109)	1 200 (122)	1 460 (149)	422 (43)
410 TP-50	11·00	1·80	0·60	9·20	4·85	5·60×2·70×2·70	139·7×114·3× 88·9	153	3 210 (327)	2 280 (232)	1 140 (116)	1 250 (131)	1 560 (159)	451 (46)
410 TP-51	11·00	1·80	0·60	9·20	5·40	5·60×2·70×2·70	139·7×114·3× 88·9	169	3 530 (360)	2 510 (256)	1 260 (128)	1 410 (144)	1 720 (175)	500 (51)
410 TP-52	11·00	1·80	0·60	9·20	4·50	5·60×2·70×2·70	165·1×139·7×114·3	173	4 250 (433)	3 010 (307)	1 510 (154)	1 700 (173)	2 060 (210)	735 (75)
410 TP-53	11·00	1·80	0·60	9·20	4·85	5·60×2·70×2·70	165·1×139·7×114·3	187	4 550 (464)	3 230 (329)	1 620 (165)	1 820 (186)	2 220 (226)	784 (80)
410 TP-54	11·00	1·80	0·60	9·20	5·40	5·60×2·70×2·70	165·1×139·7×114·3	206	5 030 (513)	3 570 (364)	1 780 (182)	2 010 (205)	2 410 (246)	863 (88)
410 TP-55	11·00	1·80	0·60	9·20	4·85	5·60×2·70×2·70	193·7×165·1×139·7	222	6 370 (650)	4 530 (462)	2 260 (231)	2 550 (260)	3 100 (316)	1 330 (136)
410 TP-56	11·00	1·80	0·60	9·20	5·40	5·60×2·70×2·70	193·7×165·1×139·7	246	6 990 (713)	4 960 (506)	2 480 (253)	2 800 (285)	3 400 (347)	1 430 (146)
410 TP-57	11·00	1·80	0·60	9·20	5·90	5·60×2·70×2·70	193·7×165·1×139·7	268	7 620 (777)	5 410 (552)	2 710 (276)	3 050 (311)	3 710 (378)	1 550(158)

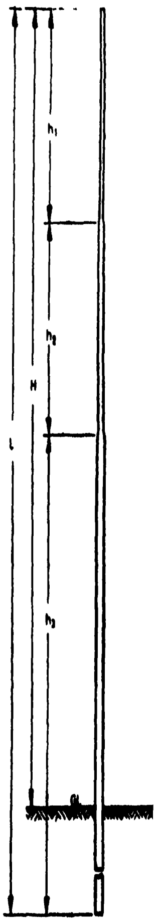


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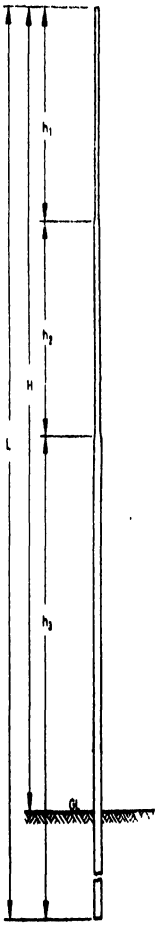
TABLE 1 STEPPED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 410 MPa (42 kgf/mm²) — *Contd*

DESIGNATION (1)	OVERALL LENGTH L (2) (m)	PLANTING DEPTH (3) (m)	LOAD APPLIED FROM TOP AT A DISTANCE (4) (m)	HEIGHT ABOVE GROUND H (5) (m)	WALL THICKNESS (6) (mm)	STEPS $h_1 \times h_2 \times h_3$ (7) (m)	OUTSIDE DIAMETER OF STEPS (8) (mm)	APPROX WEIGHT OF POLE (9) (kg)	BREAKING LOAD (10) N(kgf)	CRIPPLING LOAD (11) N(kgf)	WORKING LOAD Crippling Load 2 (12) N(kgf)	WORKING LOAD Breaking Load 2·5 (13) N(kgf)	LOAD FOR PERMANENT SET NOT EXCEEDING 13 mm (14) N(kgf)	LOAD FOR TEMPORARY DEFLECTION OF 157·5 mm (15) N(kgf)
410 TP-58	12·00	2·00	0·60	10·00	4·50	5·80×3·10×3·10	165·1×139·7×114·3	187	3 880 (396)	2 760 (281)	1 380 (141)	1 550 (158)	1 880 (192)	549 (56)
410 TP-59	12·00	2·00	0·60	10·00	4·85	5·80×3·10×3·10	165·1×139·7×114·3	202	4 160 (424)	2 950 (301)	1 480 (151)	1 670 (170)	2 020 (206)	588 (60)
410 TP-60	12·00	2·00	0·60	10·00	5·40	5·80×3·10×3·10	165·1×139·7×114·3	223	4 600 (469)	3 270 (333)	1 630 (166)	1 840 (188)	2 240 (228)	647 (66)
410 TP-61	12·00	2·00	0·60	10·00	4·85	5·80×3·10×3·10	193·7×165·1×139·7	241	5 820 (594)	4 140 (422)	2 070 (211)	2 330 (238)	2 830 (289)	971 (99)
410 TP-62	12·00	2·00	0·60	10·00	5·40	5·80×3·10×3·10	193·7×165·1×139·7	266	6 390 (652)	4 540 (463)	2 260 (231)	2 560 (261)	3 110 (317)	1 070 (109)
410 TP-63	12·00	2·00	0·60	10·00	5·90	5·80×3·10×3·10	193·7×165·1×139·7	291	6 960 (710)	4 940 (504)	2 470 (252)	2 785 (284)	3 380 (345)	1 160 (118)
410 TP-64	12·00	2·00	0·60	10·00	4·85	5·80×3·10×3·10	219·1×193·7×165·1	279	7 490 (764)	5 320 (542)	2 660 (271)	3 000 (306)	3 640 (371)	1 470 (150)
410 TP-65	12·00	2·00	0·60	10·00	5·60	5·80×3·10×3·10	219·1×193·7×165·1	319	8 541 (871)	6 060 (618)	3 030 (309)	3 410 (348)	4 150 (423)	1 680 (171)
410 TP-66	12·00	2·00	0·60	10·00	5·90	5·80×3·10×3·10	219·1×193·7×165·1	336	8 980 (916)	6 370 (650)	3 190 (325)	3 590 (366)	4 460 (445)	1 760 (179)
410 TP-67	13·00	2·00	0·60	11·00	4·85	5·80×3·60×3·60	193·7×165·1×139·7	256	5 270 (537)	3 740 (381)	1 870 (191)	2 110 (215)	2 560 (261)	696 (71)
410 TP-68	13·00	2·00	0·60	11·00	5·40	5·80×3·60×3·60	193·7×165·1×139·7	286	5 790 (590)	4 110 (419)	2 050 (209)	2 310 (236)	2 810 (287)	775 (79)
410 TP-69	13·00	2·00	0·60	11·00	5·90	5·80×3·60×3·60	193·7×165·1×139·7	312	6 300 (642)	4 470 (456)	2 240 (228)	2 530 (257)	3 060 (312)	834 (85)
410 TP-70	13·00	2·00	0·60	11·00	4·85	5·80×3·60×3·60	219·1×193·7×165·1	300	6 780 (691)	4 820 (491)	2 400 (245)	2 710 (276)	3 290 (336)	1 060 (108)
410 TP-71	13·00	2·00	0·60	11·00	5·60	5·80×3·60×3·60	219·1×193·7×165·1	343	7 720 (787)	5 480 (559)	2 740 (279)	3 090 (315)	3 750 (382)	1 220 (124)
410 TP-72	13·00	2·00	0·60	11·00	5·90	5·80×3·60×3·60	219·1×193·7×165·1	362	8 120 (828)	5 770 (588)	2 880 (294)	3 070 (313)	3 930 (402)	1 270 (130)
410 TP-73	14·50	2·00	0·60	12·50	5·40	6·50×4·00×4·00	193·7×165·1×139·7	319	5 050 (515)	3 590 (366)	1 800 (183)	2 020 (206)	2 450 (250)	520 (53)
410 TP-74	14·50	2·00	0·60	12·50	5·90	6·50×4·00×4·00	193·7×165·1×139·7	348	5 500 (561)	3 900 (398)	1 950 (199)	2 200 (224)	2 680 (273)	559 (57)
410 TP-75	14·50	2·00	0·60	12·50	5·60	6·50×4·00×4·00	219·1×193·7×165·1	382	6 750 (688)	4 790 (488)	2 392 (244)	2 700 (275)	3 280 (334)	814 (83)
410 TP-76	14·50	2·00	0·60	12·50	5·90	6·50×4·00×4·00	219·1×193·7×165·1	404	7 100 (724)	5 040 (514)	2 520 (257)	2 840 (290)	3 450 (352)	853 (87)
410 TP-77	16·00	2·30	0·60	13·70	5·40	7·00×4·50×4·50	193·7×165·1×139·7	351	4 590 (468)	3 260 (332)	1 630 (166)	1 830 (187)	2 230 (227)	382 (39)
410 TP-78	16·00	2·30	0·60	13·70	5·90	7·00×4·50×4·50	193·7×165·1×139·7	383	5 000 (510)	3 550 (362)	1 780 (181)	2 000 (204)	2 430 (248)	412 (42)
410 TP-79	16·00	2·30	0·60	13·70	5·60	7·00×4·50×4·50	219·1×193·7×165·1	421	6 130 (625)	4 350 (444)	2 180 (222)	2 450 (250)	2 980 (304)	598 (61)
410 TP-80	16·00	2·30	0·60	13·70	5·90	7·00×4·50×4·50	219·1×193·7×165·1	444	6 440 (657)	4 570 (466)	2 280 (233)	2 580 (263)	3 130 (319)	628 (64)



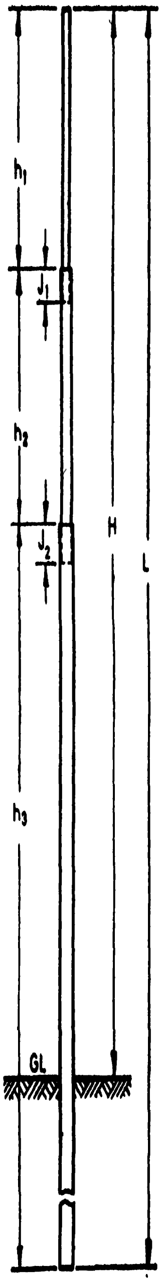
NOTE 1 — Based on the assumptions that steel weighs 7·85 g/cm³.

NOTE 2 — Before making a selection of pole it is necessary to assume a suitable factor of safety which has to be applied on breaking load or the crippling load of the pole as the case may be depending on the relevant electricity rules to obtain the working load of the pole. Values of working load of the poles with a factor of safety of 2 on crippling load and factor 2·5 on the breaking load are both given in Table 1 for information. The user will have to calculate the working loads if different factors of safety other than those stated above are applied.

TABLE 2 SWAGED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 410 MPa (42 kgf/mm²)

(*Clauses* 2.1 *and* 5.1)

Designation	Over-all Length *L*	Planting Depth	Load Applied from Top at a Distance of	Height Above Ground *H*	Length of Sections			Outside Diameter and Thickness of Sections			Approx Weight of Pole	Breaking Load	Crippling Load	Working Load		Load for Permanent Set not Exceeding 13 mm	Load for Temporary Deflection of 157·5 mm
					Bottom h_3	Middle h_2	Top h_1	Bottom	Middle	Top				Col 14 / 2	Col 13 / 2·5		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(mm)	(mm)	(mm)	(kg)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)
410 SP-1	7·00	1·25	0·30	5·75	4·00	1·50	1·50	114·3×3·65	88·9×3·25	76·1×3·25	62	2 570 (262)	1 820 (186)	912 (93)	1 030 (105)	1 245 (127)	785 (80)
410 SP-2	7·00	1·25	0·30	5·75	4·00	1·50	1·50	114·3×4·50	88·9×4·05	76·1×3·25	73	3 100 (316)	2 240 (224)	1 100 (112)	1 240 (126)	1 510 (154)	941 (96)
410 SP-3	7·00	1·25	0·30	5·75	4·00	1·50	1·50	114·3×5·40	88·9×4·85	76·1×3·25	85	3 630 (370)	2 580 (263)	1 280 (131)	1 450 (148)	1 760 (180)	1 090 (111)
410 SP-4	7·50	1·25	0·30	6·25	4·50	1·50	1·50	114·3×3·65	88·9×3·25	76·1×3·25	67	2 350 (240)	1 670 (170)	1 320 (135)	941 (96)	1 150 (117)	627 (64)
410 SP-5	7·50	1·25	0·30	6·25	4·50	1·50	1·50	114·3×4·50	88·9×4·05	76·1×3·25	79	2 760 (281)	1 960 (200)	981 (100)	1 100 (112)	1 340 (137)	745 (76)
410 SP-6	7·50	1·25	0·30	6·25	4·50	1·50	1·50	114·3×5·40	88·9×4·85	76·1×3·25	93	3 320 (339)	2 360 (241)	1 180 (120)	1 330 (136)	1 620 (165)	873 (89)
410 SP-7	7·50	1·25	0·30	6·25	4·50	1·50	1·50	139·7×4·50	114·3×3·65	88·9×3·25	97	4 330 (442)	3 080 (314)	1 540 (157)	1 740 (177)	2 110 (215)	1 400 (143)
410 SP-8	7·50	1·25	0·30	6·25	4·50	1·50	1·50	139·7×4·85	114·3×3·65	88·9×3·25	103	4 630 (472)	3 280 (335)	1 650 (168)	1 850 (189)	2 250 (229)	1 480 (151)
410 SP-9	7·50	1·25	0·30	6·25	4·50	1·50	1·50	139·7×5·40	114·3×3·65	88·9×3·25	110	5 100 (520)	3 620 (369)	1 810 (185)	2 040 (208)	2 480 (253)	1 600 (163)
410 SP-10	8·00	1·50	0·30	6·50	4·50	1·75	1·75	114·3×3·65	88·9×3·25	76·1×3·25	70	2 260 (230)	1 600 (163)	804 (82)	902 (92)	1 100 (112)	520 (53)
410 SP-11	8·00	1·50	0·30	6·50	4·50	1·75	1·75	114·3×4·50	88·9×4·05	76·1×3·25	83	2 730 (278)	1 930 (197)	971 (99)	1 090 (111)	1 320 (135)	618 (63)
410 SP-12	8·00	1·50	0·30	6·50	4·50	1·75	1·75	114·3×5·40	88·9×4·85	76·1×3·25	97	3 190 (325)	2 270 (231)	1 130 (115)	1 270 (130)	1 550 (158)	725 (74)
410 SP-13	8·00	1·50	0·30	6·50	4·50	1·75	1·75	139·7×4·50	114·3×3·65	88·9×3·25	101	4 160 (424)	2 950 (301)	1 480 (151)	1 670 (170)	2 020 (206)	1 180 (120)
410 SP-14	8·00	1·50	0·30	6·50	4·50	1·75	1·75	139·7×4·85	114·3×4·50	88·9×3·25	11	4 440 (453)	3 160 (322)	1 580 (161)	1 770 (181)	2 160 (220)	1 280 (131)
410 SP-15	8·00	1·50	0·30	6·50	4·50	1·75	1·75	139·7×5·40	114·3×4·50	88·9×3·25	119	4 890 (499)	3 470 (354)	1 740 (177)	1 960 (200)	2 380 (243)	1 380 (140)
410 SP-16	8·50	1·50	0·30	7·00	5·00	1·75	1·75	114·3×3·65	88·9×3·25	76·1×3·25	75	2 090 (213)	1 480 (151)	745 (76)	834 (85)	1 020 (104)	432 (44)
410 SP-17	8·50	1·50	0·30	7·00	5·00	1·75	1·75	114·3×4·50	88·9×4·05	76·1×3·25	89	2 520 (257)	1 790 (182)	893 (91)	1 010 (103)	1 230 (125)	510 (52)
410 SP-18	8·50	1·50	0·30	7·00	5·00	1·75	1·75	114·3×5·40	88·9×4·85	76·1×3·25	104	2 950 (301)	2 100 (214)	1 050 (107)	1 180 (120)	1 430 (146)	598 (61)
410 SP-19	8·50	1·50	0·30	7·00	5·00	1·75	1·75	139·7×4·50	114·3×3·65	88·9×3·25	109	3 844 (392)	2 730 (278)	1 360 (139)	1 540 (157)	1 800 (191)	961 (98)
410 SP-20	8·50	1·50	0·30	7·00	5·00	1·75	1·75	139·7×4·85	114·3×3·65	88·9×3·25	115	4 110 (419)	2 910 (297)	1 460 (149)	1 650 (168)	2 000 (204)	1 010 (103)
410 SP-21	8·50	1·50	0·30	7·00	5·00	1·75	1·75	139·7×5·40	114·3×4·50	88·9×3·25	129	4 530 (462)	3 220 (328)	1 620 (164)	1 810 (185)	2 210 (225)	1 130 (115)
410 SP-22	8·50	1·50	0·30	7·00	5·00	1·75	1·75	165·1×4·50	139·7×4·50	114·3×3·65	141	5 450 (556)	3 870 (395)	1 930 (197)	2 180 (222)	2 650 (270)	1 730 (176)
410 SP-23	8·50	1·50	0·30	7·00	5·00	1·75	1·75	165·1×4·85	139·7×4·50	114·3×3·65	148	5 840 (596)	4 150 (423)	2 080 (212)	2 330 (238)	2 840 (290)	1 820 (186)
410 SP-24	8·50	1·50	0·30	7·00	5·00	1·75	1·75	165·1×5·40	139·7×4·50	114·3×3·65	158	6 450 (658)	4 580 (467)	2 340 (234)	2 579 (263)	3 140 (320)	1 970 (201)
410 SP-25	9·00	1·50	0·30	7·50	5·00	2·00	2·00	114·3×3·65	88·9×3·25	76·1×3·25	78	1 940 (198)	1 380 (141)	686 (70)	775 (79)	941 (96)	333 (34)
410 SP-26	9·00	1·50	0·30	7·50	5·00	2·00	2·00	114·3×4·50	88·9×4·05	76·1×3·25	92	2 340 (239)	1 670 (170)	834 (85)	941 (96)	1 140 (116)	402 (41)
410 SP-27	9·00	1·50	0·30	7·50	5·00	2·00	2·00	114·3×5·40	88·9×4·85	76·1×3·25	108	2 750 (280)	1 950 (199)	971 (99)	1 100 (112)	1 330 (136)	461 (47)

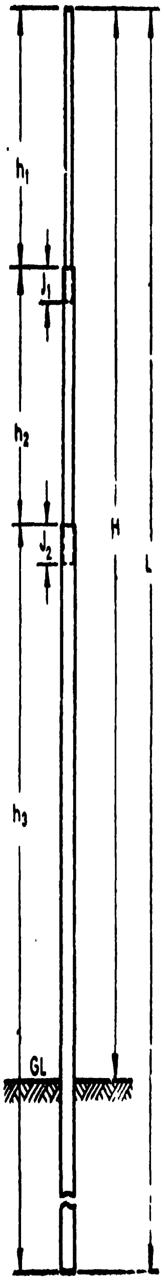


1 kg = 9·806 65 N.

(*Continued*)

TABLE 2 SWAGED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 410 MPa (42 kgf/mm²)—*Contd*

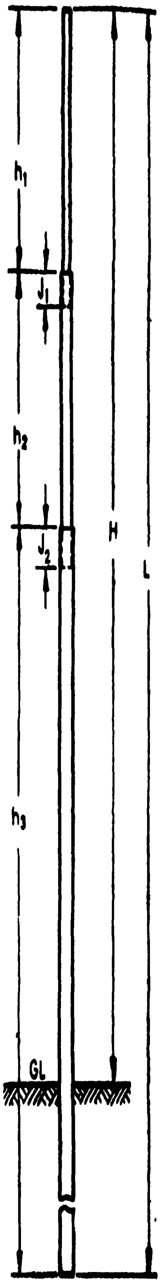
Designation	Overall Length *L*	Planting Depth	Load Applied from Top at a Distance of	Height Above Ground *H*	Length of Sections: Bottom h_3	Middle h_2	Top h_1	Outside Diameter and Thickness of Sections: Bottom	Middle	Top	Approx Weight of Pole	Breaking Load	Crippling Load	Working Load: Col 14 / 2	Col 13 / 2·5	Load for Permanent Set not Exceeding 13 mm	Load for Temporary Deflection of 157·5 mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(mm)	(mm)	(mm)	(kg)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)
410 SP-28	9·00	1·50	0·30	7·50	5·00	2·00	2·00	139·7×4·50	114·3×3·65	88·9×3·25	113	3 580 (365)	2 540 (259)	1 270 (130)	1 430 (146)	1 740 (177)	745 (76)
410 SP-29	9·00	1·50	0·30	7·50	5·00	2·00	2·00	139·7×4·85	114·3×4·50	88·9×3·25	125	3 820 (390)	2 720 (277)	1 350 (138)	1 530 (156)	1 860 (190)	814 (83)
410 SP-30	9·00	1·50	0·30	7·50	5·00	2·00	2·00	139·7×5·40	114·3×4·50	88·9×3·25	133	4 220 (430)	2 990 (305)	1 500 (153)	1 690 (172)	2 050 (209)	882 (90)
410 SP-31	9·00	1·50	0·30	7·50	5·00	2·00	2·00	165·1×4·50	139·7×4·50	114·3×3·65	147	5 070 (517)	3 600 (367)	1 800 (184)	2 030 (207)	2 460 (251)	1 360 (139)
410 SP-32	9·00	1·50	0·30	7·50	5·00	2·00	2·00	165·1×4·85	139·7×4·50	114·3×3·65	154	5 430 (554)	3 850 (393)	1 930 (197)	2 180 (222)	2 640 (269)	1 430 (146)
410 SP-33	9·00	1·50	0·30	7·50	5·00	2·00	2·00	165·1×5·40	139·7×4·50	114·3×3·65	164	6 000 (612)	4 270 (435)	2 130 (217)	2 410 (245)	2 910 (297)	1 540 (157)
410 SP-34	9·50	1·80	0·60	7·70	5·00	2·25	2·25	139·7×4·50	114·3×4·50	88·9×3·25	122	3 630 (370)	2 580 (263)	1 280 (131)	1 450 (148)	1 760 (180)	745 (76)
410 SP-35	9·50	1·80	0·60	7·70	5·00	2·25	2·25	139·7×4·85	114·3×4·50	88·9×3·25	129	3 880 (396)	2 760 (281)	1 390 (142)	1 550 (158)	1 880 (192)	784 (80)
410 SP-36	9·50	1·80	0·60	7·70	5·00	2·25	2·25	139·7×5·40	114·3×4·50	88·9×3·25	137	4 280 (436)	3 040 (310)	1 520 (155)	1 710 (174)	2 080 (212)	833 (85)
410 SP-37	9·50	1·80	0·60	7·70	5·00	2·25	2·25	165·1×4·50	139·7×4·50	114·3×3·65	153	5 150 (525)	3 660 (373)	1 820 (186)	2 060 (210)	2 500 (255)	1 300 (133)
410 SP-38	9·50	1·80	0·60	7·70	5·00	2·25	2·25	165·1×4·85	139·7×4·50	114·3×3·65	160	5 510 (562)	3 910 (399)	1 960 (200)	2 210 (225)	2 680 (273)	1 370 (140)
410 SP-39	9·50	1·80	0·60	7·70	5·00	2·25	2·25	165·1×5·40	139·7×4·50	114·3×3·65	170	6 090 (621)	4 320 (441)	2 160 (220)	2 430 (248)	2 960 (302)	1 480 (151)
410 SP-40	10·00	1·80	0·60	8·20	5·20	2·40	2·40	139·7×4·50	114·3×4·50	88·9×3·25	128	3 390 (346)	2 410 (246)	1 210 (123)	1 350 (138)	1 650 (168)	608 (62)
410 SP-41	10·00	1·80	0·60	8·20	5·20	2·40	2·40	139·7×4·85	114·3×4·50	88·9×3·25	135	3 630 (370)	2 580 (263)	1 280 (131)	1 450 (148)	1 760 (180)	637 (65)
410 SP-42	10·00	1·80	0·60	8·20	5·20	2·40	2·40	139·7×5·40	114·3×4·50	88·9×3·25	144	3 990 (407)	2 830 (289)	1 410 (144)	1 600 (163)	1 940 (198)	677 (69)
410 SP-43	10·00	1·80	0·60	8·20	5·20	2·40	2·40	165·1×4·50	139·7×4·50	114·3×3·65	160	4 810 (490)	3 410 (348)	1 710 (174)	1 920 (196)	2 330 (238)	1 060 (108)
410 SP-44	10·00	1·80	0·60	8·20	5·20	2·40	2·40	165·1×4·85	139·7×4·50	114·3×3·65	168	5 150 (525)	3 660 (373)	1 820 (186)	2 060 (210)	2 500 (255)	1 120 (114)
410 SP-45	10·00	1·80	0·60	8·20	5·20	2·40	2·40	165·1×5·40	139·7×4·50	114·3×3·65	178	5 690 (580)	4 040 (412)	2 020 (206)	2 280 (232)	2 760 (282)	1 200 (122)
410 SP-46	10·00	1·80	0·60	8·20	5·20	2·40	2·40	193·7×4·85	165·1×4·50	139·7×4·50	208	7 210 (735)	5 120 (522)	2 560 (261)	2 880 (294)	3 500 (357)	1 850 (189)
410 SP-47	10·00	1·80	0·60	8·20	5·20	2·40	2·40	193·7×5·40	165·1×4·50	139·7×4·50	221	7 910 (807)	5 620 (573)	2 800 (286)	3 170 (323)	3 840 (392)	1 990 (203)
410 SP-48	10·00	1·80	0·60	8·20	5·20	2·40	2·40	193·7×5·90	165·1×4·50	139·7×4·50	233	8 620 (879)	6 120 (624)	3 060 (312)	3 450 (352)	4 190 (427)	2 110 (215)
410 SP-49	11·00	1·80	0·60	9·20	5·60	2·70	2·70	139·7×4·50	114·3×4·50	88·9×3·25	140	3 000 (306)	2 130 (217)	1 070 (109)	1 200 (122)	1 460 (149)	412 (42)
410 SP-50	11·00	1·80	0·60	9·20	5·60	2·70	2·70	139·7×4·85	114·3×4·50	88·9×3·25	147	3 210 (327)	2 280 (232)	1 140 (116)	1 280 (131)	1 560 (159)	431 (44)
410 SP-51	11·00	1·80	0·60	9·20	5·60	2·70	2·70	139·7×5·40	114·3×5·40	88·9×3·25	164	3 530 (360)	2 510 (256)	1 260 (128)	1 410 (144)	1 720 (175)	480 (49)
410 SP-52	11·00	1·80	0·60	9·20	5·60	2·70	2·70	165·1×4·50	139·7×4·50	114·3×3·65	175	4 250 (433)	3 010 (307)	1 510 (154)	1 700 (173)	2 060 (210)	726 (74)
410 SP-53	11·00	1·80	0·60	9·20	5·60	2·70	2·70	165·1×4·85	139·7×4·50	114·3×3·65	183	4 550 (464)	3 230 (329)	1 620 (165)	1 820 (186)	2 220 (226)	765 (78)
410 SP-54	11·00	1·80	0·60	9·20	5·60	2·70	2·70	165·1×5·40	139·7×4·50	114·3×3·65	194	5 030 (513)	3 570 (364)	1 780 (182)	2 010 (205)	2 440 (249)	814 (83)
410 SP-55	11·00	1·80	0·60	9·20	5·60	2·70	2·70	193·7×4·85	165·1×4·50	139·7×4·50	227	6 370 (650)	4 530 (462)	2 260 (231)	2 550 (260)	3 100 (316)	1 270 (130)
410 SP-56	11·00	1·80	0·60	9·20	5·60	2·70	2·70	193·7×5·40	165·1×4·50	139·7×4·50	241	6 990 (713)	4 920 (502)	2 480 (253)	2 790 (285)	3 400 (347)	1 370 (140)
410 SP-57	11·00	1·80	0·60	9·20	5·60	2·70	2·70	193·7×5·90	165·1×4·85	139·7×4·50	256	7 620 (777)	5 410 (552)	2 710 (276)	3 050 (311)	3 710 (378)	1 470 (150)



(*Continued*)

TABLE 2 SWAGED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 410 MPa (42 kgf/mm²) — *Contd*

DESIGNATION	OVER-ALL LENGTH *L*	PLANTING DEPTH	LOAD APPLIED FROM TOP AT A DISTANCE OF	HEIGHT ABOVE GROUND *H*	LENGTH OF SECTIONS			OUTSIDE DIAMETER AND THICKNESS OF SECTIONS			APPROX WEIGHT OF POLE	BREAKING LOAD	CRIPPLING LOAD	WORKING LOAD		LOAD FOR PERMANENT SET NOT EXCEEDING 13 mm	LOAD FOR TEMPORARY DEFLECTION OF 157·5 mm
					Bottom h_3	Middle h_2	Top h_1	Bottom	Middle	Top				Col 14 2	Col 13 2·5		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(mm)	(mm)	(mm)	(kg)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)
410 SP-58	12·00	2·00	0·60	10·00	5·80	3·10	3·10	165·1×4·50	139·7×4·50	114·3×3·65	186	3 880 (396)	2 760 (281)	1 380 (141)	1 550 (158)	1 880 (192)	539 (55)
410 SP-59	12·00	2·00	0·60	10·00	5·80	3·10	3·10	165·1×4·85	139·7×4·50	114·3×3·65	197	4 160 (424)	2 950 (301)	1 480 (151)	1 670 (170)	2 020 (206)	569 (58)
410 SP-60	12·00	2·00	0·60	10·00	5·80	3·10	3·10	165·1×5·40	139·7×4·50	114·3×3·65	208	4 600 (469)	3 270 (333)	1 630 (166)	1 840 (188)	2 240 (228)	598 (61)
410 SP-61	12·00	2·00	0·60	10·00	5·80	3·10	3·10	193·7×4·85	165·1×4·50	139·7×4·50	245	5 820 (594)	4 140 (422)	2 070 (211)	2 330 (238)	2 830 (289)	951 (97)
410 SP-62	12·00	2·00	0·60	10·00	5·80	3·10	3·10	193·7×5·40	165·1×4·50	139·7×4·50	259	6 390 (652)	4 540 (463)	2 270 (231)	2 560 (261)	3 110 (317)	1 010 (103)
410 SP-63	12·00	2·00	0·60	10·00	5·80	3·10	3·10	193·7×5·90	165·1×4·85	139·7×4·50	277	6 960 (710)	4 940 (504)	2 470 (252)	2 790 (284)	3 390 (345)	1 090 (111)
410 SP-64	12·00	2·00	0·60	10·00	5·80	3·10	3·10	219·1×4·85	193·7×4·85	165·1×4·50	292	7 490 (764)	5 320 (542)	2 660 (271)	3 000 (306)	3 640 (371)	1 460 (149)
410 SP-65	12·00	2·00	0·60	10·00	5·80	3·10	3·10	219·1×5·60	193·7×4·85	165·1×4·50	313	8 530 (871)	6 060 (618)	3 030 (309)	3 410 (348)	4 150 (423)	1 610 (164)
410 SP-66	12·00	2·00	0·60	10·00	5·80	3·10	3·10	219·1×5·90	193·7×4·85	165·1×4·50	322	8 980 (916)	6 370 (650)	3 190 (325)	3 590 (366)	4 360 (445)	1 660 (169)
410 SP-67	13·00	2·00	0·60	11·00	5·80	3·60	3·60	193·7×4·85	165·1×4·50	139·7×4·50	261	5 270 (537)	3 740 (381)	1 870 (191)	2 110 (215)	2 560 (261)	677 (69)
410 SP-68	13·00	2·00	0·60	11·00	5·80	3·60	3·60	193·7×5·40	165·1×4·85	139·7×4·50	281	5 790 (590)	4 110 (419)	2 050 (209)	2 310 (236)	2 810 (287)	735 (75)
410 SP-69	13·00	2·00	0·60	11·00	5·80	3·60	3·60	193·7×5·90	165·1×5·40	139·7×4·50	302	6 300 (642)	4 470 (456)	2 240 (228)	2 520 (257)	3 060 (312)	794 (81)
410 SP-70	13·00	2·00	0·60	11·00	5·80	3·60	3·60	219·1×4·85	193·7×4·85	165·1×4·50	312	6 780 (691)	4 820 (491)	2 400 (245)	2 710 (276)	3 300 (336)	1 060 (108)
410 SP-71	13·00	2·00	0·60	11·00	5·80	3·60	3·60	219·1×5·60	193·7×4·85	165·1×4·50	333	7 720 (787)	5 480 (559)	2 740 (279)	3 090 (315)	3 750 (382)	1 160 (118)
410 SP-72	13·00	2·00	0·60	11·00	5·80	3·60	3·60	219·1×5·90	193·7×4·85	165·1×4·50	343	8 120 (828)	5 770 (588)	2 880 (294)	3 250 (331)	3 940 (402)	1 190 (121)
410 SP-73	14·50	2·00	0·60	12·50	6·50	4·00	4·00	193·7×5·40	165·1×4·85	139·7×4·50	312	5 050 (515)	3 590 (366)	1 790 (183)	2 020 (206)	2 450 (250)	500 (51)
410 SP-74	14·50	2·00	0·60	12·50	6·50	4·00	4·00	193·7×5·90	165·1×5·40	139·7×4·50	336	5 500 (561)	3 900 (398)	1 950 (199)	2 200 (224)	2 680 (273)	539 (55)
410 SP-75	14·50	2·00	0·60	12·50	6·50	4·00	4·00	219·1×5·60	193·7×4·85	165·1×4·50	370	6 750 (688)	4 790 (488)	2 390 (244)	2 700 (275)	3 780 (334)	775 (79)
410 SP-76	14·50	2·00	0·60	12·50	6·50	4·00	4·00	219·1×5·90	193·7×4·85	165·1×4·50	380	7 100 (724)	5 040 (514)	2 520 (257)	2 840 (290)	3 450 (352)	794 (81)
410 SP-77	16·00	2·30	0·60	13·70	7·00	4·50	4·50	193·7×5·40	165·1×4·85	139·7×4·50	341	4 590 (468)	3 260 (332)	1 630 (166)	1 830 (187)	2 230 (227)	363 (37)
410 SP-78	16·00	2·30	0·60	13·70	7·00	4·50	4·50	193·7×5·90	165·1×5·40	139·7×4·50	367	5 000 (510)	3 550 (362)	1 780 (181)	2 000 (204)	2 430 (248)	392 (40)
410 SP-79	16·00	2·30	0·60	13·70	7·00	4·50	4·50	219·1×5·60	193·7×4·85	165·1×4·50	403	6 130 (625)	4 350 (444)	2 180 (222)	2 450 (250)	2 980 (304)	569 (58)
410 SP-80	16·00	2·30	0·60	13·70	7·00	4·50	4·50	219·1×5·90	193·7×4·85	165·1×4·50	416	6 440 (657)	4 570 (466)	2 280 (233)	2 580 (263)	3 130 (319)	588 (60)



NOTE 1 — Based on assumptions that steel weighs 7·85 g/cm³.

NOTE 2 — Before making a selection of pole it is necessary to assume a suitable factor of safety which has to be applied on breaking load or the crippling load of the pole as the case may be depending on the relevant electricity rules to obtain the working load of the pole. Values of working load of the poles with a factor of safety 2 on crippling load and factor 2·5 on breaking load are both given in Table 2 for information. The user will have to calculate the working loads if different factor of safety other than those stated above are applied.

TABLE 3 STRUCTURAL PROPERTIES OF TUBULAR STEEL STEPPED POLES (BOTH HIGH TENSILE AND MILD STEEL POLES)

(Clauses 5.2 of Part II and III)

DESIGNATION		EFFECTIVE LENGTH			SECTION MODULUS			RATIO OF SECTION MODULUS AND EFFECTIVE LENGTH Min Z/L	EQUIVALENT WIND LOAD W_1	MOMENT OF INERTIA			CROSS-SECTIONAL AREA		
		l_1	l_2	l_3	Z_1 Top	Z_2 Middle	Z_3 Bottom			I_1 Top	I_2 Middle	I_3 Bottom	A_1 Top	A_2 Middle	A_3 Bottom
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
		cm	cm	cm	cm³	cm³	cm³		N(kgf)	cm⁴	cm⁴	cm⁴	cm²	cm²	cm²
410 TP-1	540 TP-1	140	310	545	14·4	20·0	34·0	0·062 4	175 (17·5)	54·65	88·92	194·4	8·31	9·77	12·7
410 TP-2	540 TP-2	140	310	545	17·1	24·0	41·0	0·075 2	175 (17·5)	65·12	107·0	234·3	10·1	11·9	15·5
410 TP-3	540 TP-3	140	310	545	19·8	27·9	48·0	0·088 1	175 (17·5)	73·34	123·9	274·5	12·0	14·16	18·5
410 TP-4	540 TP-4	145	320	595	14·4	20·0	34·0	0·057 1	192 (19·2)	54·65	88·92	194·4	8·31	9·77	12·7
410 TP-5	540 TP-5	145	320	595	17·1	24·0	41·0	0·068 9	192 (19·2)	65·12	107·0	234·3	10·1	11·9	15·5
410 TP-6	540 TP-6	145	320	595	19·8	27·9	48·0	0·080 7	192 (19·2)	73·34	123·9	274·5	12·0	14·16	18·5
410 TP-7	540 TP-7	145	320	595	24·0	41·0	62·6	0·105 2	234 (23·4)	107·0	234·3	437·2	11·9	15·5	19·1
410 TP-8	540 TP-8	145	320	595	25·5	43·8	66·9	0·112 4	234 (23·4)	113·46	250·1	467·6	12·8	16·7	20·5
410 TP-9	540 TP-9	145	320	595	27·9	48·0	73·7	0·123 9	234 (23·4)	123·9	274·5	514·5	14·16	18·5	22·8
410 TP-10	540 TP-10	150	330	620	14·4	20·0	34·0	0·054 8	199 (19·9)	54·65	88·92	194·4	8·31	9·77	12·7
410 TP-11	540 TP-11	150	330	620	17·1	24·0	41·0	0·066 1	199 (19·9)	65·12	107·0	234·3	10·1	11·9	15·5
410 TP-12	540 TP-12	150	330	620	19·8	27·9	48·0	0·077 4	199 (19·9)	73·34	123·9	274·5	12·0	14·16	18·5
410 TP-13	540 TP-13	150	330	620	24·0	41·0	62·6	0·101 0	243 (24·3)	107·0	234·3	437·2	11·9	15·5	19·1
410 TP-14	540 TP-14	150	330	620	25·5	43·8	66·9	0·107 9	243 (24·3)	113·46	250·1	467·6	12·8	16·7	20·5
410 TP-15	540 TP-15	150	330	620	27·9	48·0	73·7	0·118 9	243 (24·3)	123·9	274·5	514·5	14·16	18·5	22·8
410 TP-16	540 TP-16	170	370	670	14·4	20·0	34·0	0·050 7	213 (21·3)	54·65	88·92	194·4	8·31	9·77	12·7
410 TP-17	540 TP-17	170	370	670	17·1	24·0	41·0	0·061 2	213 (21·3)	65·12	107·0	234·3	10·1	11·9	15·5
410 TP-18	540 TP-18	170	370	670	19·8	27·9	48·0	0·071 6	213 (21·3)	73·34	123·9	274·5	12·0	14·16	18·5
410 TP-19	540 TP-19	170	370	670	24·0	41·0	62·6	0·093 4	260 (26·0)	107·0	234·3	437·2	11·9	15·5	19·1
410 TP-20	540 TP-20	170	370	670	25·5	43·8	66·9	0·099 9	260 (26·0)	113·46	250·1	467·6	12·8	16·7	20·5
410 TP-21	540 TP-21	170	370	670	27·9	48·0	73·7	0·110 0	260 (26·0)	123·9	274·5	514·5	14·16	18·5	22·8
410 TP-22	540 TP-22	170	370	670	41·0	62·6	88·7	0·132 4	321 (32·1)	234·3	437·2	732·6	15·5	19·1	22·7
410 TP-23	540 TP-23	170	370	670	43·8	66·9	95·0	0·141 8	321 (32·1)	250·1	467·6	784·5	16·7	20·5	24·4
410 TP-24	540 TP-24	170	370	670	48·0	73·7	105·0	0·156 7	321 (32·1)	274·5	514·5	864·7	18·5	22·8	27·1
410 TP-25	540 TP-25	180	390	720	14·4	20	34	0·047 2	228 (22·8)	54·65	88·92	194·4	8·31	9·77	12·7
410 TP-26	540 TP-26	180	390	720	17·1	24	41	0·056 9	228 (22·8)	65·12	107·0	234·3	10·1	11·9	15·5
410 TP-27	540 TP-27	180	390	720	19·8	27·9	48	0·066 7	228 (22·8)	73·34	123·9	274·5	12·0	14·16	18·5
410 TP-28	540 TP-28	180	390	720	24·0	41·0	62·6	0·086 9	278 (27·8)	107·0	234·3	437·2	11·9	15·5	19·1
410 TP-29	540 TP-29	180	390	720	25·5	43·8	66·9	0·092 9	278 (27·8)	113·46	250·1	467·6	12·8	16·7	20·5

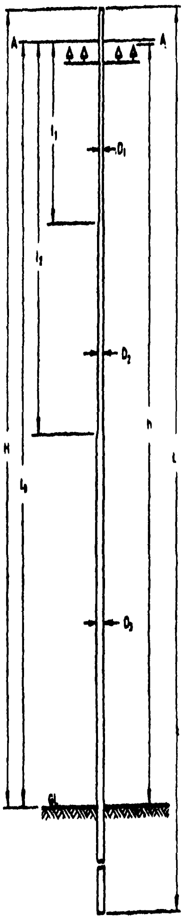


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TABLE 3 STRUCTURAL PROPERTIES OF TUBULAR STEEL STEPPED POLES (BOTH HIGH TENSILE AND MILD STEEL POLES) — *Contd*

DESIGNATION		EFFECTIVE LENGTH			SECTION MODULUS			RATIO OF SECTION MODULUS AND EFFECTIVE LENGTH *Min* Z/L	EQUIVALENT WIND LOAD W_1	MOMENT OF INERTIA			CROSS-SECTIONAL AREA		
		l_1	l_2	l_3	Z_1 Top	Z_2 Middle	Z_3 Bottom			I_1 Top	I_2 Middle	I_3 Bottom	A_1 Top	A_2 Middle	A_3 Bottom
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
		cm	cm	cm	cm^3	cm^3	cm^3		N(kgf)	cm^4	cm^4	cm^4	cm^2	cm^2	cm^2
410 TP-30	540 TP-30	180	390	720	27·9	48·0	73·7	0·102 4	278 (27·8)	123·9	274·5	514·5	14·16	18·5	22·8
410 TP-31	540 TP-31	180	390	720	41·0	62·6	88·7	0·123 2	345 (34·5)	234·3	437·2	732·6	15·5	19·1	22·7
410 TP-32	540 TP-32	180	390	720	43·8	66·9	95·0	0·131 9	345 (34·5)	250·1	467·6	784·5	16·7	20·5	24·4
410 TP-33	540 TP-33	180	390	720	48·0	73·7	105·0	0·145 8	345 (34·5)	274·5	514·5	864·7	18·5	22·8	27·1
410 TP-34	540 TP-34	170	400	710	24·0	41·0	62·6	0·088 2	294 (29·4)	107·0	234·3	437·2	11·9	15·5	19·1
410 TP-35	540 TP-35	170	400	710	25·5	43·8	66·9	0·094 2	294 (29·4)	113·46	250·1	467·6	12·8	16·7	20·5
410 TP-36	540 TP-36	170	400	710	27·9	48·0	73·7	0·103 8	294 (29·4)	123·9	274·5	514·5	14·16	18·5	22·8
410 TP-37	540 TP-37	170	400	710	41·0	62·6	88·7	0·124 9	364 (36·4)	234·3	437·2	732·6	15·5	19·1	22·7
410 TP-38	540 TP-38	170	400	710	43·8	66·9	95·0	0·133 8	364 (36·4)	250·1	467·7	784·5	16·7	20·5	24·4
410 TP-39	540 TP-39	170	400	710	48·0	73·7	105·0	0·147 9	364 (36·4)	274·5	514·5	864·7	18·5	22·8	27·1
410 TP-40	540 TP-40	180	420	760	24·0	41·0	62·6	0·082 4	312 (31·2)	107·0	234·3	437·2	11·9	15·5	19·1
410 TP-41	540 TP-41	180	420	760	25·5	43·8	66·9	0·088 0	312 (31·2)	113·46	250·1	467·6	12·8	16·7	20·5
410 TP-42	540 TP-42	180	420	760	27·9	48·0	73·7	0·097 0	312 (31·2)	123·9	274·5	514·5	14·16	18·5	22·8
410 TP-43	540 TP-43	180	420	760	41·0	62·6	88·7	0·116 7	387 (38·7)	234·3	437·2	732·2	15·5	19·1	22·7
410 TP-44	540 TP-44	180	420	760	43·8	66·9	95·0	0·125 0	387 (38·7)	250·1	467·6	784·5	16·7	20·5	24·4
410 TP-45	540 TP-45	180	420	760	48·0	73·7	105·0	0·138 2	387 (38·7)	274·5	514·5	864·7	18·5	22·8	27·1
410 TP-46	540 TP-46	180	420	760	66·9	95·0	133·0	0·175 0	467 (46·7)	467·6	784·5	1 284	20·5	24·4	28·7
410 TP-47	540 TP-47	180	420	760	73·7	105·0	146·0	0·192 1	467 (46·7)	514·5	864·7	1 417	22·8	27·1	31·9
410 TP-48	540 TP-48	180	420	760	79·6	113·3	159·0	0·209 2	467 (46·7)	555·8	935·7	1 536	24·8	29·5	34·8
410 TP-49	540 TP-49	210	480	860	24·0	41·0	62·6	0·072 8	347 (34·7)	54·65	88·92	194·4	8·31	9·77	12·7
410 TP-50	540 TP-50	210	480	860	25·5	43·8	66·9	0·077 8	347 (34·7)	65·12	107·0	234·3	10·1	11·9	15·5
410 TP-51	540 TP-51	210	480	860	27·9	48·0	73·7	0·085 7	347 (34·7)	73·34	123·9	274·5	12·0	14·16	18·5
410 TP-52	540 TP-52	210	480	860	41·7	62·6	88·7	0·103 1	431 (43·1)	107·0	234·3	437·2	11·9	15·5	19·1
410 TP-53	540 TP-53	210	480	860	43·8	66·9	95·0	0·110 5	431 (43·1)	113·46	250·1	467·6	12·8	16·7	20·5
410 TP-54	540 TP-54	210	480	860	48·0	73·7	105·0	0·122 1	431 (43·1)	123·9	274·5	514·5	14·16	18·5	22·8
410 TP-55	540 TP-55	210	480	860	66·9	95·0	133·0	0·154 7	520 (52·0)	234·3	437·2	732·6	15·5	19·1	22·7
410 TP-56	540 TP-56	210	480	860	73·7	105·0	146·0	0·169 8	520 (52·0)	250·1	467·6	784·5	16·7	20·5	24·4
410 TP-57	540 TP-57	210	480	860	79·6	113·3	159·0	0·184 9	520 (52·0)	274·5	514·5	864·7	18·5	22·8	27·1

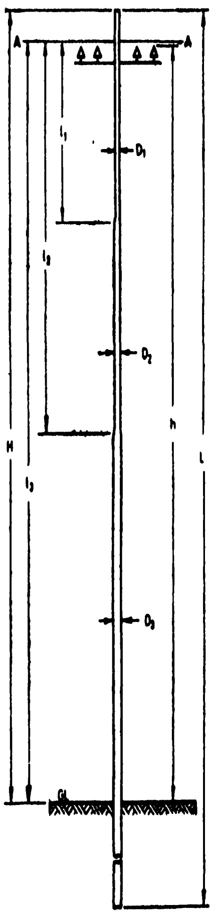

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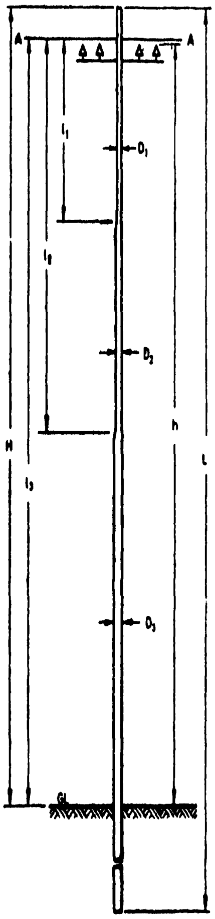
TABLE 3 STRUCTURAL PROPERTIES OF TUBULAR STEEL STEPPED POLES (BOTH HIGH TENSILE AND MILD STEEL POLES) — *Contd*

Designation		Effective Length			Section Modulus			Ratio of Section Modulus and Effective Length Min Z/L	Equivalent Wind Load W_1	Moment of Inertia			Cross-Sectional Area		
		l_1	l_2	l_3	Z_1 Top	Z_2 Middle	Z_3 Bottom			I_1 Top	I_2 Middle	I_3 Bottom	A_1 Top	A_2 Middle	A_3 Bottom
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
		cm	cm	cm	cm^3	cm^3	cm^3		N(kgf)	cm^4	cm^4	cm^4	cm^2	cm^2	cm^2
410 TP-58	540 TP-58	250	560	940	41·0	62·6	88·7	0·094 4	461 (46·1)	107·0	234·3	437·2	11·9	15·5	19·1
410 TP-59	540 TP-59	250	560	940	43·8	66·9	95·0	0·101 1	461 (46·1)	113·46	250·1	467·6	12·8	16·7	20·5
410 TP-60	540 TP-60	250	560	940	48·0	73·7	105·0	0·111 7	461 (46·1)	123·9	274·5	514·5	14·16	18·5	22·8
410 TP-61	540 TP-61	250	560	940	66·9	95·0	133·0	0·141 5	557 (55·7)	234·3	437·2	732·6	15·5	19·1	22·7
410 TP-62	540 TP-62	250	560	940	73·7	105·0	146·0	0·155 3	557 (55·7)	250·1	467·6	784·5	16·7	20·5	24·4
410 TP-63	540 TP-63	250	560	940	79·6	113·3	159·0	0·169 1	557 (55·7)	274·5	514·5	864·7	18·5	22·8	27·1
410 TP-64	540 TP-64	250	560	940	95·0	133·0	171·0	0·181 9	652 (65·2)	784·5	1 284	1 874	24·4	28·7	32·6
410 TP-65	540 TP-65	250	550	940	108·0	151·0	195·0	0·207 4	652 (65·2)	893·0	1 465	2 142	28·1	33·1	37·6
410 TP-66	540 TP-66	250	560	940	113·3	159·0	205·0	0·218 1	652 (65·2)	935·7	1 536	2 247	29·5	34·8	39·5
410 TP-67	540 TP-67	300	660	1 040	66·9	95·0	133·0	0·127 9	604 (60·4)	234·3	437·3	732·6	15·5	19·1	22·7
410 TP-68	540 TP-68	300	660	1 040	73·7	105·0	146·0	0·140 4	604 (60·4)	250·1	467·6	784·5	16·7	20·5	24·4
410 TP-69	540 TP-69	300	660	1 040	79·6	113·3	159·0	0·152 9	604 (60·4)	274·5	514·5	864·7	18·5	22·8	27·1
410 TP-70	540 TP-70	300	660	1 040	95·0	133·0	171·0	0·164 4	709 (70·9)	784·5	1 284	1 874	24·4	28·7	32·6
410 TP-71	540 TP-71	300	660	1 040	108·0	151·0	195·0	0·187 5	709 (70·9)	893·0	1 465	2 142	28·1	33·1	37·6
410 TP-72	540 TP-72	300	660	1 040	113·3	159·0	205·0	0·197 1	709 (70·9)	935·7	1 536	2 247	29·5	34·8	39·5
410 TP-73	540 TP-73	340	740	1 190	73·7	105·0	146·0	0·122 7	684 (68·4)	514·5	864·7	1 417·0	22·8	27·1	31·9
410 TP-74	540 TP-74	340	740	1 190	79·6	113·3	159·0	0·133 6	684 (68·4)	555·8	935·7	1 536·0	24·8	29·5	34·8
410 TP-75	540 TP-75	340	740	1 190	108·0	151·0	195·0	0·163 9	802 (80·2)	893·0	1 465·0	2 142·0	28·1	33·1	37·6
410 TP-76	540 TP-76	340	740	1 190	113·3	159·0	205·0	0·172 3	802 (80·2)	935·7	1 536·0	2 247·0	29·5	34·8	39·5
410 TP-77	540 TP-77	390	840	1 310	73·7	105·0	146·0	0·111 5	758 (75·8)	514·5	864·7	1 417·0	22·8	27·1	31·9
410 TP-78	540 TP-78	390	840	1 310	79·6	113·3	159·0	0·121 4	758 (75·8)	555·8	935·7	1 536·0	24·8	29·5	34·8
410 TP-79	540 TP-79	390	840	1 310	108·0	151·0	195·0	0·148 9	886 (88·6)	893·0	1 465·0	2 142·0	28·1	33·1	37·6
410 TP-80	540 TP-80	390	840	1 310	113·3	159·0	205·0	0·156 5	886 (88·6)	935·7	1 536·0	2 247·0	29·5	34·8	39·5



NOTE — Equivalent wind load based on wind pressure of 1 000 MPa (approx 100 kg/mm²) on flat surface.

TABLE 4 STRUCTURAL PROPERTIES OF TUBULAR STEEL SWAGED POLES (BOTH HIGH TENSILE AND MILD STEEL POLES)

(*Clauses* 5.2 *of Part II and*)III

DESIGNATION		EFFECTIVE LENGTH l_1	l_2	l_3	SECTION MODULUS Z_1 Top	Z_2 Middle	Z_3 Bottom	RATIO OF SECTION MODULUS AND EFFECTIVE LENGTH *Min* Z/L *Min*	EQUIVALENT WIND LOAD W_1	MOMENT OF INERTIA I_1 Top	I_2 Middle	I_3 Bottom	CROSS-SECTIONAL AREA A_1 Top	A_2 Middle	A_3 Bottom	JOINT LENGTH J_1	J_2
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
		cm	cm	cm	cm³	cm³	cm³		N(kgf)	cm⁴	cm⁴	cm⁴	cm²	cm²	cm²	cm	cm
410 SP- 1	540 SP- 1	120	270	545	13·0	18·1	34·0	0·062 4	180 (18 0)	49·44	80·31	194·4	7·44	8·74	12·7	20	23
410 SP- 2	540 SP- 2	120	270	545	13·0	21·9	41·0	0·075 2	186 (18·6)	49·44	97·38	234·3	7·44	10·8	15·5	20	23
410 SP- 3	540 SP- 3	120	270	545	13·0	25·5	48·0	0·088 1	194 (19·4)	49·44	113·46	274·5	7·44	12·8	18·5	20	23
410 SP- 4	540 SP- 4	120	270	595	13·0	18·1	34·0	0·057 1	198 (19·8)	49·44	80·31	194·4	7·44	8·74	12·7	20	23
410 SP- 5	540 SP- 5	120	270	595	13·0	21·9	41·0	0·068 9	198 (19·8)	49·44	87·38	234·3	7·44	10·8	15·5	20	23
410 SP- 6	540 SP- 6	120	270	595	13·0	25·5	48·0	0·080 7	198 (19·8)	49·44	113·46	274·5	7·44	12·8	18·5	20	23
410 SP- 7	540 SP- 7	120	270	595	18·1	34·0	62·6	0·105 2	242 (24·2)	80·31	194·4	437·2	8·74	12·7	19·1	23	30
410 SP- 8	540 SP- 8	120	270	595	18·1	34 0	66·9	0·112 4	242 (24·2)	80·31	194·4	467·6	8·74	12·7	20·5	23	30
410 SP- 9	540 SP- 9	120	270	595	18·1	34·0	73·7	0·123 9	242 (24·2)	80·31	194·4	514·5	8·74	12·7	22·8	23	30
410 SP-10	540 SP-10	145	320	620	13·0	18·8	34·0	0·054 8	201 (20·1)	49·44	80·31	194·4	7·44	8·74	12·7	20	23
410 SP-11	540 SP-11	145	320	620	13·0	21·9	41·0	0·066 1	201 (20·1)	49·44	87·38	234·3	7·44	10·8	15·5	20	23
410 SP-12	540 SP-12	145	320	620	13·0	25·5	48·0	0·077 4	201 (20·1)	49·44	113·46	274·5	7·44	12·8	18·5	20	23
410 SP-13	540 SP-13	145	320	620	18·1	34·0	62·6	0·101 0	245 (24·5)	80·31	194·4	437·2	8·74	12·7	19·1	23	30
410 SP-14	540 SP-14	145	320	620	18·1	41·0	66·9	0·107 9	245 (24·5)	80·31	234·3	467·6	8·74	15·5	20·5	23	30
410 SP-15	540 SP-15	145	320	620	18·1	41·0	73·7	0·118 9	245 (24·5)	80·31	234·3	514·5	8·74	15·5	22·8	23	30
410 SP-16	540 SP-16	145	320	470	13·0	18·1	34·0	0·050 7	214 (21·4)	49·44	80·31	194·4	7·44	8·74	12·7	20	23
410 SP-17	540 SP-17	145	320	470	13·0	21·9	41·0	0·061 2	214 (21·4)	49·44	87·38	234·3	7·44	10·8	15·5	20	23
410 SP-18	540 SP-18	145	320	470	13·0	25·5	48·0	0·071 6	214 (21·4)	49·44	113·46	274·5	7·44	12·8	18·5	20	23
410 SP-19	540 SP-19	145	320	470	18·1	34·0	62·6	0·093 4	261 (26·1)	80·31	194·4	437·2	8·74	12·7	19·1	23	30
410 SP-20	540 SP-20	145	320	470	18·1	34·0	66·9	0·099 9	261 (26·1)	80·31	194·4	467·6	8·74	12·7	20·5	23	30
410 SP-21	540 SP-21	145	320	470	18·1	41·0	73·7	0·110 0	261 (26·1)	80·31	234·3	514·5	8·74	15·5	22·8	23	30
410 SP-22	540 SP-22	145	320	470	34·0	62·6	88·7	0·132 4	329 (32·9)	194 4	437·2	732·6	12·7	19·1	22·7	30	35
410 SP-23	540 SP-23	145	320	470	34·0	62·6	95·0	0·141 8	329 (32·9)	194·4	437·2	784·5	12·7	19·1	24·4	30	35
410 SP-24	540 SP-24	145	320	470	34·0	62·6	105·0	0·156 7	329 (32·9)	194·4	437·2	864·7	12·7	19·1	27·1	30	35
410 SP-25	540 SP-25	170	370	720	13·0	18·1	34 0	0·047 2	230 (23·0)	49·44	80·31	194·4	7·44	8·74	12·7	20	23
410 SP-26	540 SP-26	170	370	720	13·0	21·9	41·0	0·056 9	230 (23·0)	49·44	97·38	234·3	7·44	10·8	15·5	20	23
410 SP-27	540 SP-27	170	370	720	13·0	25·5	48·0	0·066 7	230 (23·0)	49·44	113·46	274·5	7·44	12·8	18·5	20	23
410 SP-28	540 SP-28	170	370	720	18·1	34·0	62·6	0·086 9	282 (28·2)	80·31	194·4	437·2	8·74	12·7	19·1	23	30
410 SP-29	540 SP-29	170	370	720	18·1	41·0	66·9	0·092 9	282 (28·2)	80·31	234·3	467·6	8·74	15·5	20·5	23	30

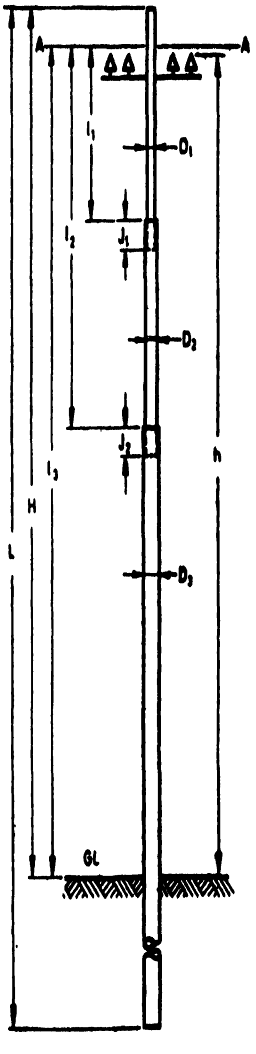


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TABLE 4 STRUCTURAL PROPERTIES OF TUBULAR STEEL SWAGED POLES (BOTH HIGH TENSILE AND MILD STEEL POLES) — *Contd*

Designation		Effective Length l_1	Effective Length l_2	Effective Length l_3	Section Modulus Z_1 Top	Section Modulus Z_2 Middle	Section Modulus Z_3 Bottom	Ratio of Section Modulus and Effective Length *Min* Z/L *Min*	Equivalent Wind Load W_1	Moment of Inertia I_1 Top	Moment of Inertia I_2 Middle	Moment of Inertia I_3 Bottom	Cross-Sectional Area A_1 Top	Cross-Sectional Area A_2 Middle	Cross-Sectional Area A_3 Bottom	Joint Length J_1	Joint Length J_2
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
		cm	cm	cm	cm³	cm³	cm³		N(kgf)	cm⁴	cm⁴	cm⁴	cm²	cm²	cm²	cm	cm
410 SP-30	540 SP-30	170	370	720	18·1	41·0	73·7	0·102 4	282 (28·2)	80·31	234·3	514·5	8·74	15·5	22·8	23	30
410 SP-31	540 SP-31	170	370	720	34·0	62·6	88·7	0·123 2	348 (34·8)	194·4	437·2	732·6	12·7	19·1	22·7	30	35
410 SP-32	540 SP-32	170	370	720	34·0	62·6	95·0	0·131 9	348 (34·8)	194·4	437·2	784·5	12·7	19·1	24·4	30	35
410 SP-33	540 SP-33	170	370	720	34·0	62·6	105·0	0·145 8	348 (34·8)	194·4	437·2	864·7	12·7	19·1	27·1	30	35
410 SP-34	540 SP-34	165	390	710	18·1	41·0	62·6	0·088 2	295 (29·5)	80·31	234·3	437·2	8·74	15·5	19·1	23	30
410 SP-35	540 SP-35	165	390	710	18·1	41·0	66·9	0·094 2	295 (29·5)	80·31	234·3	467·6	8·74	15·5	20·5	23	30
410 SP-36	540 SP-36	165	390	710	18·1	41·0	73·7	0·103 8	295 (29·5)	80·31	234·3	514·5	8·74	15·5	22·8	23	30
410 SP-37	540 SP-37	165	390	710	34·0	62·6	88·7	0·124 9	366 (36·6)	194·4	437·2	732·6	12·7	19·1	22·7	30	35
410 SP-38	540 SP-38	165	390	710	34·0	62·6	95·0	0·133 8	366 (36·6)	194·4	437·2	784·5	12·7	19·1	24·4	30	35
410 SP-39	540 SP-39	165	390	710	34·0	62·6	105·0	0·147 9	366 (36·6)	194·4	437·2	864·7	12·7	19·1	27·1	30	35
410 SP-40	540 SP-40	180	420	760	18·1	41·0	62·6	0·082 4	313 (31·3)	80·31	234·3	437·2	8·74	15·5	19·1	23	30
410 SP-41	540 SP-41	180	420	760	18·1	41·0	66·9	0·088 0	313 (31·3)	80·31	234·3	467·6	8·74	15·5	20·5	23	30
410 SP-42	540 SP-42	180	420	760	18·1	41·0	73·7	0·097 0	313 (31·3)	80·31	234·3	514·5	8·74	15·5	22·8	23	30
410 SP-43	540 SP-43	180	420	760	34·0	62·6	88·7	0·116 7	387 (38·7)	194·4	437·2	732·6	12·7	19·1	22·7	30	35
410 SP-44	540 SP-44	180	420	760	34·0	62·6	95·0	0·125 0	387 (38·7)	194·4	437·2	784·5	12·7	19·1	24·4	30	35
410 SP-45	540 SP-45	180	420	760	34·0	62·6	105·0	0·138 2	387 (38·7)	194·4	437·2	864·7	12·7	19·1	27·1	30	35
410 SP-46	540 SP-46	180	420	760	62·6	88·7	133·0	0·175 0	464 (46·4)	437·2	732·6	1 284·0	19·1	22·7	28·7	35	40
410 SP-47	540 SP-47	180	420	760	62·6	88·7	146·0	0·192 1	464 (46·4)	437·2	732·6	1 417·0	19·1	22·7	31·9	35	40
410 SP-48	540 SP-48	180	420	760	62·6	88·7	159·0	0·209 2	464 (46·4)	437·2	732·6	1 536·0	19·1	22·7	34·8	35	40
410 SP-49	540 SP-49	210	480	860	18·1	41·0	62·6	0·072 8	347 (34·7)	80·31	234·3	437·2	8·74	15·5	19·1	23	30
410 SP-50	540 SP-50	210	480	860	18·1	41·0	66·9	0·077 8	347 (34·7)	80·31	234·3	467·6	8·74	15·5	20·5	23	30
410 SP-51	540 SP-51	210	480	860	18·1	48·0	73·7	0·085 7	347 (34·7)	80·31	274·5	514·5	8·74	15·5	22·8	23	30
410 SP-52	540 SP-52	210	480	860	34·0	62·6	88·7	0·103 1	431 (43·1)	194·4	437·2	732·6	12·7	19·1	22·7	30	35
410 SP-53	540 SP-53	210	480	860	34·0	62·6	95·0	0·110 5	431 (43·1)	194·4	437·2	784·5	12·7	19·1	24·4	30	35
410 SP-54	540 SP-54	210	480	860	34·0	62·6	105·0	0·122 1	431 (43·1)	194·4	437·2	864·7	12·7	19·1	27·1	30	35
410 SP-55	540 SP-55	210	480	860	62·6	88·7	133·0	0·154 7	516 (51·6)	437·2	732·6	1 284·0	19·1	22·7	31·9	35	40
410 SP-56	540 SP-56	210	480	860	62·6	88·7	146·0	0·169 8	516 (51·6)	437·2	732·6	1 417·0	19·1	22·7	31·9	35	40
410 SP-57	540 SP-57	210	480	860	62·6	95·0	159·0	0·184 9	516 (51·6)	437·2	784·5	1 536·0	19·1	24·4	34·8	35	40

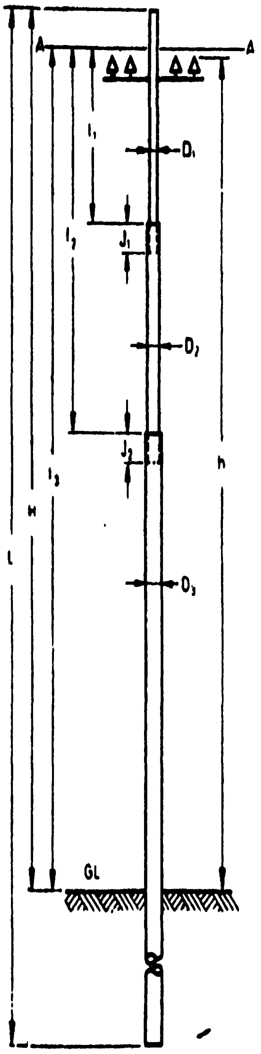

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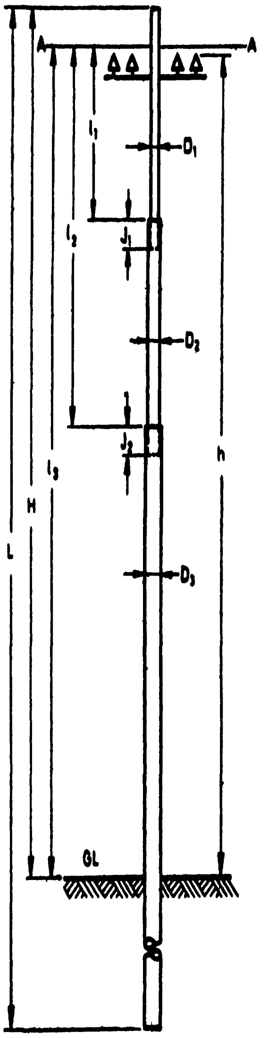
TABLE 4 STRUCTURAL PROPERTIES OF TUBULAR STEEL SWAGED POLES (BOTH HIGH TENSILE AND MILD STEEL POLES) — *Contd*

DESIGNATION		EFFECTIVE LENGTH			SECTION MODULUS			RATIO OF SECTION MODULUS AND EFFECTIVE LENGTH *Min* *Z/L Min*	EQUIVALENT WIND LOAD W_1	MOMENT OF INERTIA			CROSS-SECTIONAL AREA			JOINT LENGTH	
		l_1	l_2	l_3	Z_1 Top	Z_2 Middle	Z_3 Bottom			I_1 Top	I_2 Middle	I_3 Bottom	A_1 Top	A_2 Middle	A_3 Bottom	J_1	J_2
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
		cm	cm	cm	cm^3	cm^3	cm^3		N(kgf)	cm^4	cm^4	cm^4	cm^2	cm^2	cm^2	cm	cm
410 SP-58	540 SP-58	250	560	940	34·0	62·6	88·7	0·094 4	461 (46·1)	194·4	437·2	7 732·6	12·7	19·1	22·7	30	35
410 SP-59	540 SP-59	250	560	940	34·0	62·6	95·0	0·101 1	461 (46·1)	194·4	437·2	7 754·5	12·7	19·1	24·4	30	35
410 SP-60	540 SP-60	250	560	940	34·0	62·6	105·0	0·117	461 (46·1)	194·4	437·2	8 864·7	12·7	19·1	27·1	30	35
410 SP-61	540 SP-61	250	560	940	62·6	88·7	133·0	0·141 5	553 (55·3)	437·2	732·6	1 284·0	19·1	22·7	28·7	35	40
410 SP-62	540 SP-62	250	560	940	62·6	88·7	146·0	0·155 3	553 (55·3)	437·2	732·6	1 417·0	19·1	22·7	31·9	35	40
410 SP-63	540 SP-63	250	560	940	62·6	95·0	159·0	0·169 1	553 (55·3)	437·2	784·5	1 536·0	19·1	24·4	34·8	35	40
410 SP-64	540 SP-64	250	560	940	88·7	133·0	171·0	0·181 9	647 (64·7)	732·6	1 284·0	1 874·0	22·7	28·7	32·6	40	45
410 SP-65	540 SP-65	250	560	940	88·7	133·0	195·0	0·207 4	647 (64·7)	732·6	1 284·0	2 142·0	22·7	28·7	37·6	40	45
410 SP-66	540 SP-66	250	560	940	88·7	133·0	205·0	0·218 1	647 (64·7)	732·6	1 284·0	2 247·0	22·7	28·7	39·5	40	45
410 SP-67	540 SP-67	300	660	1 040	62·6	88·7	133·0	0·127 9	600 (60·0)	437·2	732·6	1 284·0	19·1	22·7	28·7	35	40
410 SP-68	540 SP-68	300	660	1 040	62·6	95·0	146·0	0·140 4	600 (60·0)	437·2	784·5	1 417·0	19·1	24·4	31·9	35	40
410 SP-69	540 SP-69	300	660	1 040	62·6	105·0	159·0	0·152 9	600 (60·0)	437·2	864·7	1 536·0	19·1	27·1	34·8	35	40
410 SP-70	540 SP-70	300	660	1 040	88·7	133·0	171·0	0·164 4	702 (70·2)	732·6	1 284·0	1 874·0	22·7	28·7	32·6	40	45
410 SP-71	540 SP-71	300	660	1 040	88·7	133·0	195·0	0·187 5	702 (70·2)	732·6	1 284·0	2 142·0	22·7	28·7	37·6	40	45
410 SP-72	540 SP-72	300	660	1 040	88·7	133·0	205·0	0·197 1	702 (70·2)	732·6	1 284·0	2 247·0	22·7	28·7	39·5	40	45
410 SP-73	540 SP-73	340	740	1 190	62·6	95·0	146·0	0·122 7	684 (68·4)	437·2	784·5	1 417·0	19·1	24·4	31·9	35	40
410 SP-74	540 SP-74	340	740	1 190	62·6	105·0	159·0	0·133 6	684 (68·4)	437·2	864·7	1 536·0	19·1	27·1	34·8	35	40
410 SP-75	540 SP-75	340	740	1 190	88·7	133·0	195·0	0·163 9	902 (90·2)	732·6	1 284·0	2 142·0	22·7	28·7	37·6	40	45
410 SP-76	540 SP-76	340	740	1 190	88·7	133·0	205·0	0·172 3	902 (90·2)	732·6	1 284·0	2 247·0	22·7	28·7	39·5	40	45
410 SP-77	540 SP-77	390	840	1 310	62·6	95·0	146·0	0·111 5	738 (73·8)	437·2	784·5	1 417·0	19·1	24·4	31·9	35	40
410 SP-78	540 SP-78	390	840	1 310	62·6	105·0	159·0	0·121 4	738 (73·8)	437·2	864·7	1 536·0	19·1	27·1	34·8	35	40
410 SP-79	540 SP-79	390	840	1 310	88·7	133·0	195·0	0·148 9	873 (87·3)	732·6	1 284·0	2 142·0	22·7	28·7	37·6	40	45
410 SP-80	540 SP-80	390	840	1 310	88·7	133·0	205·0	0·156 5	873 (87·3)	732·6	1 284·0	2 247·0	22·7	28·7	39·5	40	45



NOTE — Equivalent wind load based on wind pressure of 1 000 MPa (approx 100 kg/mm²) on flat surface.

Indian Standard

SPECIFICATION FOR TUBULAR STEEL POLES FOR OVERHEAD POWER LINES

PART III SPECIAL REQUIREMENTS FOR POLES MADE FROM STEEL OF TENSILE STRENGTH 540 MPa

(Second Revision)

1. SCOPE

1.1 This part covers the special requirements for tubular steel poles of circular cross section made of steel of minimum tensile strength 540 MPa overhead power lines. The general requirements are covered in Part I.

2. DESIGNATION

2.1 Tubular steel stepped and swaged poles conforming to this standard (Part III) shall be designated as 540 TP and 540 SP respectively, followed by a serial number as shown in col 1 of Tables 1 and 2.

> Example: 540 SP 12 IS 2713 (Parts I and III)-1980

3. TUBES FOR THE MANUFACTURE OF POLES

3.1 The tubes for making poles shall conform to grade YSt 310 of IS : 1161-1979* except that

a) Manual metal arc welding process may also be used to manufacture tubes.

b) Cold bend test need not be conducted.

3.1.1 For mechanical test the tubes shall be sampled as per IS : 4711-1974* depending on the number of tubes in the lot to be inspected.

4. PHYSICAL REQUIREMENTS FOR FINISHED POLES

4.1 The steel sample obtained from the finished pole when tested in accordance with IS : 1894-1972† shall show a minimum tensile strength of 540 MPa (55·0 kgf/mm²) and a minimum percentage elongation specified in **10.1.1** and **10.1.1.1** of IS : 1161-1979‡.

5. DIMENSIONS AND STRUCTURAL PROPERTIES

5.1 The dimensions of poles shall be as given in Table 1 for stepped poles and Table 2 for swaged poles. Useful properties of these poles calculated on the basis of dimensions are also given in Tables 1 and 2.

5.2 A few structural properties which are useful in designing the poles are given in Tables 3 and 4 of Part II of this standard.

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*Specification for steel tubes for structural purposes (*third revision*).

1 MPa = 0·101 972 kgf/mm².

*Methods for sampling of steel pipes, tubes and fittings (*first revision*).

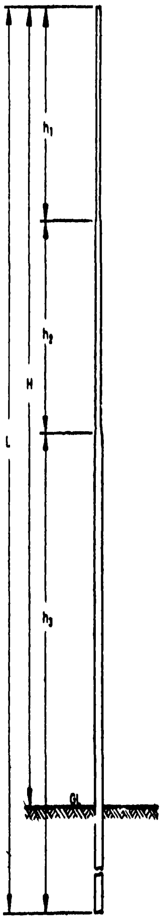
†Method for tensile testing of steel tubes (*first revision*).

‡Specification for steel tubes for structural purposes (*third revision*).

TABLE 1 STEPPED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 540 MPa (55 kgf/mm²)

(*Clauses* 2.1, 5.1 *and* A-4.1.1)

DESIGNATION	OVER-ALL LENGTH *L*	PLANTING DEPTH	LOAD APPLIED FROM TOP AT A DISTANCE	HEIGHT ABOVE GROUND *H*	WALL THICKNESS	STEPS	OUTSIDE DIAMETER OF STEPS	APPROX WEIGHT OF POLE	BREAKING LOAD	CRIPPLING LOAD	WORKING LOAD		LOAD FOR PERMANENT SET NOT EXCEEDING 13 mm	LOAD FOR TEMPORARY DEFLECTION OF 157·5 mm
						$h_3 \times h_2 \times h_1$	D_3 D_2 D_1				Crippling Load 2	Breaking Load 2·5		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	(m)	(m)	(m)	(m)	(mm)	(m)	(mm)	(kg)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)
540 TP 1	7·00	1·25	0·30	5·75	3·65	3·60×1·70×1·70	114·3×88·9×76·1	60	3 360 (343)	2 390 (244)	1 200 (122)	1 340 (137)	1 640 (167)	745 (76)
540 TP- 2	7·00	1·25	0·30	5·75	4·50	3·60×1·70×1·70	114·3×88·9×76·1	73	4 060 (414)	2 880 (294)	1 440 (147)	1 630 (166)	1 970 (201)	902 (92)
540 TP- 3	7·00	1·25	0·30	5·75	5·40	3·60×1·70×1·70	114·3×88·9×76·1	87	4 750 (484)	3 370 (344)	1 690 (172)	1 900 (194)	2 300 (235)	990 (101)
540 TP- 4	7·50	1·25	0·30	6·25	3·65	4·00×1·75×1·75	114·3×88·9×76·1	65	3 080 (314)	2 190 (223)	1 090 (111)	1 240 (126)	1 500 (153)	598 (61)
540 TP- 5	7·50	1·25	0·30	6·25	4·50	4·00×1·75×1·75	114·3×88·9×76·1	79	3 720 (379)	2 640 (269)	1 320 (135)	1 490 (152)	1 800 (184)	716 (73)
540 TP- 6	7·50	1·25	0·30	6·25	5·40	4·00×1·75×1·75	114·3×88·9×76·1	94	4 350 (444)	3 090 (315)	1 550 (158)	1 750 (178)	2 120 (216)	834 (85)
540 TP- 7	7·50	1·25	0·30	6·25	4·50	4·00×1·75×1·75	139·7×114·3×88·9	97	5 680 (579)	4 030 (411)	2 020 (206)	2 280 (232)	2 760 (281)	1 380 (141)
540 TP- 8	7·50	1·25	0·30	6·25	4·85	4·00×1·75×1·75	139·7×114·3×88·9	105	6 060 (618)	4 300 (439)	2 150 (219)	2 420 (247)	2 940 (300)	1 470 (150)
540 TP- 9	7·50	1·25	0·30	6·25	5·40	4·00×1·75×1·75	139·7×114·3×88·9	116	6 680 (681)	4 750 (484)	2 370 (242)	2 670 (272)	3 250 (331)	1 620 (165)
540 TP-10	8·00	1·50	0·30	6·50	3·65	4·40×1·80×1·80	114·3×88·9×76·1	69	2 960 (302)	2 100 (214)	1 050 (107)	1 190 (121)	1 440 (147)	530 (54)
540 TP-11	8·00	1·50	0·30	6·50	4·50	4·40×1·80×1·80	114·3×88·9×76·1	88	3 620 (369)	2 570 (262)	1 280 (131)	1 450 (148)	1 760 (179)	637 (65)
540 TP-12	8·00	1·50	0·30	6·50	5·40	4·40×1·80×1·80	114·3×88·9×76·1	101	4 180 (426)	2 960 (302)	1 480 (151)	1 670 (170)	2 030 (207)	745 (76)
540 TP-13	8·00	1·50	0·30	6·50	4·50	4·40×1·80×1·80	139·7×114·3×88·9	104	5 440 (555)	3 860 (394)	1 930 (197)	2 180 (222)	2 650 (270)	1 230 (125)
540 TP-14	8·00	1·50	0·30	6·50	4·85	4·40×1·80×1·80	139·7×114·3×88·9	113	5 820 (593)	4 130 (421)	2 070 (211)	2 320 (237)	2 820 (288)	1 300 (133)
540 TP-15	8·00	1·50	0·30	6·50	5·40	4·40×1·80×1·80	139·7×114·3×88·9	125	6 410 (654)	4 550 (464)	2 280 (232)	2 570 (262)	3 120 (318)	1 400 (147)
540 TP-16	8·50	1·50	0·30	7·00	3·65	4·50×2·00×2·00	114·3×88·9×76·1	73	2 740 (279)	1 940 (198)	971 (99)	1 100 (112)	1 330 (136)	412 (42)
540 TP 17	8·50	1·50	0·30	7·00	4·50	4·50×2·00×2·00	114·3×88·9×76·1	89	3 300 (337)	2 340 (239)	1 180 (120)	1 320 (135)	1 610 (164)	490 (50)
540 TP-18	8·50	1·50	0·30	7·00	5·40	4·50×2·00×2·00	114·5×88·9×76·1	106	3 000 (394)	2 750 (280)	1 370 (140)	1 550 (158)	1 870 (191)	589 (59)
540 TP-19	8·50	1·50	0·50	7·00	4·50	4·50×2·00×2·00	139·7×114·3×88·9	110	5 040 (514)	3 580 (365)	1 780 (182)	2 020 (206)	2 450 (206)	951 (97)
540 TP-20	8·50	1·50	0·30	7·00	4·85	4·50×2·00×2·00	139·7×114·3×88·9	119	5 380 (549)	3 820 (390)	1 910 (195)	2 160 (220)	2 620 (267)	1 020 (104)
540 TP-21	8·50	1·50	0·30	7·00	5·40	4·50×2·00×2·00	139·7×114·3×88·9	132	5 930 (605)	4 220 (430)	2 110 (215)	2 370 (242)	2 880 (294)	1 120 (114)
540 TP-22	8·50	1·50	0·30	7 00	4·50	4·50×2·00×2·00	165·1×139·7×114·3	134	7 140 (728)	5 070 (517)	2 530 (258)	2 850 (291)	3 470 (354)	1 660 (169)
540 TP-23	8·50	1·50	0·30	7·00	4·85	4·50×2·00×2·00	165·1×139·7×114·3	145	7 650 (780)	5 430 (554)	2 720 (277)	3 060 (312)	3 720 (379)	1 780 (181)
540 TP-24	8·50	1·50	0·30	7·00	5·40	4·50×2·00×2·00	165·1×139·7×114·3	160	8 450 (862)	6 000 (612)	3 000 (306)	3 380 (345)	4 110 (419)	1 950 (199)

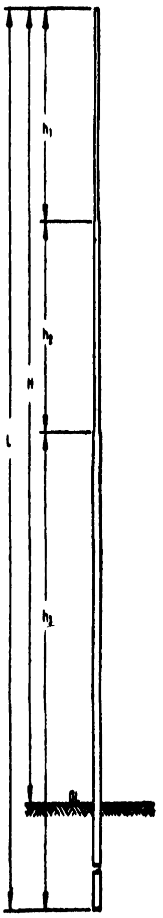


1 kgf = 9·806 65 N.

(*Continued*)

TABLE 1 STEPPED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 540 MPa (55 kgf/mm²) — *Contd*

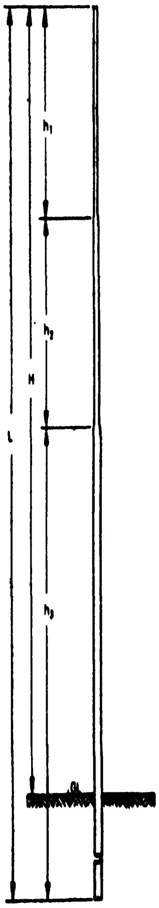
Designation	Over-all Length L	Planting Depth	Load Applied from Top at a Distance	Height Above Ground H	Wall Thickness	Steps $h_3 \times h_2 \times h_1$	Outside Diameter of Steps D_3 D_2 D_1	Approx Weight of Pole	Breaking Load	Crippling Load	Working Load		Load for Permanent Set not Exceeding 13 mm	Load for Temporary Deflection of 157·5 mm
											Crippling Load 2	Breaking Load 2·5		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	(m)	(m)	(m)	(m)	(mm)	(m)	(mm)	(kg)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)
540 TP-25	9·00	1·50	0·30	7·50	3·65	4·80×2·10×2·10	114·3×88·9×76·1	78	2 550 (260)	1 810 (185)	902 (92)	1 020 (104)	1 240 (126)	333 (34)
540 TP-26	9·00	1·50	0·30	7·50	4·50	4·80×2·10×2·10	114·3×88·9×76·1	94	3 070 (313)	2 810 (222)	1 090 (111)	1 230 (125)	1 490 (152)	402 (41)
540 TP-27	9·00	1·50	0·30	7·50	5·40	4·80×2·10×2·10	114·3×88·9×76·1	113	3 600 (367)	2 560 (261)	1 280 (130)	1 440 (147)	1 750 (178)	471 (48)
540 TP-28	9·00	1·50	0·30	7·50	4·50	4·80×2·10×2·10	139·7×114·3×88·9	117	4 690 (478)	3 320 (339)	1 670 (170)	1 870 (191)	2 280 (232)	775 (79)
540 TP-29	9·00	1·50	0·30	7·50	4·85	4·80×2·10×2·10	139·7×114·3×88·9	126	5 010 (511)	3 560 (363)	1 780 (181)	2 000 (204)	2 430 (248)	824 (84)
540 TP-30	9·00	1·50	0·30	7·50	5·40	4·80×2·10×2·10	139·7×114·3×88·9	140	5 520 (563)	3 920 (400)	1 960 (200)	2 210 (225)	2 690 (274)	912 (93)
540 TP-31	9·00	1·50	0·30	7·50	4·50	4·80×2·10×2·10	165·1×139·7×114·3	142	6 650 (678)	4 720 (481)	2 363 (241)	2 660 (271)	3 240 (330)	1 340 (137)
540 TP-32	9·00	1·50	0·30	7·50	4·85	4·80×2·10×2·10	165·1×139·7×114·3	154	7 120 (726)	5 050 (515)	2 530 (258)	2 840 (290)	3 460 (353)	1 440 (147)
540 TP-33	9·00	1·50	0·30	7·50	5·40	4·80×2·10×2·10	165·1×139·7×114·3	170	7 860 (802)	5 580 (569)	2 790 (285)	3 150 (321)	3 820 (390)	1 590 (162)
540 TP-34	9·50	1·80	0·60	7·70	4·50	4·90×2·30×2·30	139·7×114·3×88·9	122	4 760 (485)	3 370 (344)	1 690 (172)	1 900 (194)	2 310 (236)	745 (76)
540 TP-35	9·50	1·80	0·60	7·70	4·85	4·90×2·30×2·30	139·7×114·3×88·9	133	5 080 (518)	3 610 (368)	1 800 (184)	2 030 (207)	2 470 (252)	794 (81)
540 TP-36	9·50	1·80	0·60	7·70	5·40	4·90×2·30×2·30	139·7×114·3×88·9	147	5 600 (571)	3 970 (405)	1 900 (203)	2 240 (228)	2 730 (278)	883 (90)
540 TP-37	9·50	1·80	0·60	7·70	4·50	4·90×2·30×2·30	165·1×139·7×114·3	149	6 740 (687)	4 790 (488)	2 390 (244)	2 700 (275).	3 280 (334)	1 300 (133)
540 TP-38	9·50	1·80	0·60	7·70	4·85	4·90×2·30×2·30	165·1×139·7×114·3	161	7 200 (736)	5 130 (523)	2 560 (261)	2 880 (294)	3 510 (358)	1 390 (142)
540 TP-39	9·50	1·80	0·60	7·70	5·40	4·90×2·30×2·30	165·1×139·7×114·3	178	7 970 (813)	5 660 (577)	2 830 (289)	3 190 (325)	3 870 (395)	1 540 (157)
540 TP-40	10·00	1·80	0·60	8·20	4·50	5·20×2·40×2·40	139·7×114·3×88·9	129	4 440 (453)	3 160 (322)	1 580 (161)	1 780 (181)	2 160 (220)	618 (63)
540 TP-41	10·00	1·80	0·60	8·20	4·85	5·20×2·40×2·40	139·7×114·3×88·9	140	4 750 (484)	3 370 (344)	1 690 (172)	1 900 (194)	2 300 (235)	686 (70)
540 TP-42	10·00	1·80	0·60	8·20	5·40	5·20×2·40×2·40	139·7×114·3×88·9	155	5 230 (533)	3 710 (378)	1 850 (189)	2 090 (213)	2 540 (259)	726 (74)
540 TP-43	10·00	1·80	0·60	8·20	4·50	5·20×2·40×2·40	165·1×139·7×114·3	157	6 300 (642)	4 470 (456)	2 240 (228)	2 520 (257)	3 060 (312)	1 070 (109)
540 TP-44	10·00	1·80	0·60	8·20	4·85	5·20×2·40×2·40	165·1×139·7×114·3	170	6 750 (688)	4 790 (488)	2 390 (244)	2 700 (275)	3 280 (334)	1 150 (117)
540 TP-45	10·00	1·80	0·60	8·20	5·40	5·20×2·40×2·40	165·1×139·7×114·3	188	7 450 (760)	5 300 (540)	2 650 (270)	2 980 (304)	3 620 (369)	1 260 (128)
540 TP-46	10·00	1·80	0·60	8·20	4·85	5·20×2·40×2·40	193·7×165·1×139·7	202	9 440 (963)	6 710 (684)	3 350 (342)	3 780 (385)	4 590 (468)	1 890 (193)
540 TP-47	10·00	1·80	0·60	8·20	5·40	5·20×2·40×2·40	193·7×165·1×139·7	224	10 400(1 057)	7 360 (750)	3 680 (375)	4 150 (423)	5 040 (514)	2 090 (213)
540 TP-48	10·00	1·80	0·60	8·20	5·90	5·20×2·40×2·40	193·7×165·1×139·7	244	11 300(1 151)	8 010 (817)	4 010 (409)	4 510 (460)	5 480 (559)	2 270 (231)
540 TP-49	11·00	1·80	0·60	9·20	4·50	5·60×2·70×2·70	139·7×114·3×88·9	141	3 920 (400)	2 780 (284)	1 390 (142)	1 570 (160)	1 900 (194)	422 (43)
540 TP-50	11·00	1·80	0·60	9·20	4·85	5·60×2·70×2·70	139·7×114·3×88·9	153	4 200 (428)	2 980 (304)	1 490 (152)	1 680 (171)	2 040 (208)	451 (46)
540 TP-51	11·00	1·80	0·60	9·20	5·40	5·60×2·70×2·70	139·7×114·3×88·9	169	4 620 (471)	3 280 (334)	1 640 (167)	1 840 (188)	2 250 (229)	500 (51)
540 TP-52	11·00	1·80	0·60	9·20	4·50	5·60×2·70×2·70	165·1×139·7×114·3	173	5 560 (567)	3 950 (403)	1 970 (201)	2 230 (227)	2 710 (276)	735 (75)
540 TP-53	11·00	1·80	0·60	9·20	4·85	5·60×2·70×2·70	165·1×139·7×114·3	187	5 960 (608)	4 240 (432)	2 120 (216)	2 380 (243)	2 890 (295)	784 (80)



(Continued)

TABLE 1 STEPPED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 540 MPa (55 kgf/mm²) — *Contd*

DESIGNATION	OVERALL LENGTH L	PLANTING DEPTH	LOAD APPLIED FROM TOP AT A DISTANCE	HEIGHT ABOVE GROUND H	WALL THICKNESS	STEPS $h_3 \times h_2 \times h_1$	OUTSIDE DIAMETER OF STEPS D_3 D_2 D_1	APPROX WEIGHT OF POLE	BREAKING LOAD	CRIPPLING LOAD	WORKING LOAD Crippling Load 2	WORKING LOAD Breaking Load 2·5	LOAD FOR PERMANENT SET NOT EXCEEDING 13 mm	LOAD FOR TEMPORARY DEFLECTION OF 157·5 mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	(m)	(m)	(m)	(m)	(mm)	(m)	(mm)	(kg)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)	N(kgf)
540 TP-54	11·00	1·80	0·60	9·20	5·40	5·60×2·70×2·70	165·1×139·7×114·3	206	6 590 (672)	4 680 (477)	2 340 (239)	2 640 (269)	3 210 (327)	863 (88)
540 TP-55	11·00	1·80	0·60	9·20	4·85	5·60×2·70×2·70	193·7×165·1×139·7	222	8 340 (851)	5 920 (604)	2 960 (302)	3 330 (340)	4 060 (414)	1 330 (136)
540 TP-56	11·00	1·80	0·60	9·20	5·40	5·60×2·70×2·70	193·7×165·1×139·7	246	9 160 (934)	6 500 (663)	3 260 (332)	3 670 (374)	4 450 (454)	1 430 (146)
540 TP-57	11·00	1·80	0·60	9·20	5·90	5·60×2·70×2·70	193·7×165·1×139·7	268	9 970(1 017)	7 080 (722)	3 540 (361)	3 990 (407)	4 840 (494)	1 550 (158)
540 TP-58	12·00	2·00	0·60	10·00	4·50	5·80×3·10×3·10	165·1×139·7×114·3	187	5 090 (519)	3 610 (368)	1 800 (184)	2 040 (208)	2 470 (252)	549 (56)
540 TP-59	12·00	2·00	0·60	10·00	4·85	5·80×3·10×3·10	165·1×139·7×114·3	202	5 450 (556)	3 870 (395)	1 930 (197)	2 180 (222)	2 650 (270)	588 (60)
540 TP-60	12·00	2·00	0·60	10·00	5·40	5·80×3·10×3·10	165·1×139·7×114·3	223	6 020 (614)	4 280 (436)	2 140 (218)	2 410 (246)	2 920 (298)	647 (66)
540 TP-61	12·00	2·00	0·60	10·00	4·85	5·80×3·10×3·10	193·7×165·1×139·7	241	7 630 (778)	5 410 (552)	2 710 (276)	3 050 (311)	3 710 (378)	971 (99)
540 TP-62	12·00	2·00	0·60	10·00	5·40	5·80×3·10×3·10	193·7×165·1×139·7	266	8 380 (854)	5 940 (606)	2 970 (303)	3 350 (342)	4 070 (415)	1 070 (109)
540 TP-63	12·00	2·00	0·60	10·00	5·90	5·80×3·10×3·10	193·7×165·1×139·7	291	9 120 (930)	6 470 (660)	3 240 (330)	3 650 (372)	4 430 (452)	1 160 (118)
540 TP-64	12·00	2·00	0·60	10·00	4·85	5·80×3·10×3·10	219·1×193·7×165·1	279	9 820(1 001)	6 970 (711)	3 480 (355)	3 920 (400)	4 770 (486)	1 470 (150)
540 TP-65	12·00	2·00	0·60	10·00	5·60	5·80×3·10×3·10	219·1×193·7×165·1	319	11 200(1 141)	7 940 (810)	3 970 (405)	4 470 (456)	5 440 (555)	1 680 (171)
540 TP-66	12·00	2·00	0·60	10·00	5·90	5·80×3·10×3·10	219·1×193·7×165·1	336	11 800(1 199)	8 340 (851)	4 180 (426)	4 710 (480)	5 720 (583)	1 760 (179)
540 TP-67	13·00	2·00	0·60	11·00	4·85	5·80×3·60×3·60	193·7×165·1×139·7	256	6 890 (703)	4 890 (499)	2 450 (250)	2 760 (281)	3 350 (342)	696 (71)
540 TP-68	13·00	2·00	0·60	11·00	5·40	5·80×3·60×3·60	193·7×165·1×139·7	286	7 570 (772)	5 370 (548)	2 690 (274)	3 030 (309)	3 680 (375)	765 (78)
540 TP-69	13·00	2·00	0·60	11·00	5·90	5·80×3·60×3·60	193·7×165·1×139·7	312	8 250 (841)	5 850 (597)	2 930 (299)	3 300 (336)	4 010 (409)	834 (85)
540 TP-70	13·00	2·00	0·60	11·00	4·85	5·80×3·60×3·60	219·1×193·7×165·1	300	8 860 (904)	6 300 (642)	3 150 (321)	3 550 (362)	4 310 (439)	1 060 (108)
540 TP-71	13·00	2·00	0·60	11·00	5·60	5·80×3·60×3·60	219·1×193·7×165·1	343	10 100(1 031)	7 180 (732)	3 590 (366)	4 040 (412)	4 910 (501)	1 220 (124)
540 TP-72	13·00	2·00	0·60	11·00	5·90	5·80×3·60×3·60	219·1×193·7×165 1	362	10 600(1 084)	7 550 (770)	3 780 (385)	4 260 (434)	5 170 (527)	1 270 (130)
540 TP-73	14·50	2·00	0·60	12·50	5·40	6·50×4·00×4·00	193·7×165·1×139·7	319	6 620 (675)	4 700 (479)	2 350 (240)	2 650 (270)	3 220 (328)	520 (53)
540 TP-74	14·50	2·00	0·60	12·50	5·90	6·50×4·00×4 00	193·7×165·1×139·7	348	7 210 (735)	5 120 (522)	2 560 (261)	2 880 (294)	3 500 (357)	559 (57)
540 TP-75	14·50	2·00	0·60	12·50	5·60	6·50×4 00×4·00	219·1×193·7×165·1	382	8 840 (901)	6 280 (640)	3 140 (320)	3 530 (360)	4 300 (438)	814 (83)
540 TP-76	14·50	2·00	0·60	12·50	5·90	6·50×4·00×4·00	219·1×193·7×165·1	404	9 290 (947)	6 590 (672)	3 300 (336)	3 720 (379)	4 510 (460)	853 (87)
540 TP-77	16·00	2·30	0·60	13·70	5·40	7·00×4·50×4·50	193·7×165·1×139·7	351	6 010 (613)	4 270 (435)	2 140 (218)	2 400 (245)	2 920 (298)	382 (39)
540 TP-78	16·00	2·30	0·60	13·70	5·90	7·00×4 50×4·50	193·7×165·1×139·7	383	6 550 (668)	4 650 (474)	2 320 (237)	2 620 (267)	3 190 (325)	412 (42)
540 TP-79	16·00	2·30	0·60	13·70	5·60	7·00×4·50×4·50	219·1×193·7×165·1	421	8 030 (819)	5 700 (581)	2 850 (291)	3 220 (328)	3 900 (398)	598 (61)
540 TP-80	16·00	2·30	0·60	13·70	5·90	7·00×4·50×4·50	219·1×193·7×165·1	444	8 440 (861)	5 990 (611)	3 000 (306)	3 370 (344)	4 100 (418)	628 (64)



NOTE 1 — Based on assumption that steel weighs 7·85 g/cm³.

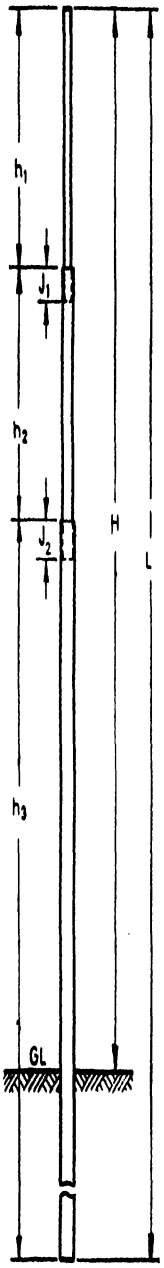
NOTE 2 — Before making a selection of pole it is necessary to assume a suitable factor of safety which has to be applied on breaking load or the crippling load of the pole as the case may be depending on the relevant electricity rules to obtain the working load of the pole. Values of working load of the poles with a factor of safety 2 on crippling load and factor 2·5 on breaking load are both given in Table 1 for information. The user will have to calculate the working loads if different factors of safety other than those stated above are applied.

TABLE 2 SWAGED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 540 MPa (55 kgf/mm²)

(*Clauses* 2.1 *and* 5.1)

Designation	Over-all Length *L*	Planting Depth	Load Applied from Top at a Distance	Height Above Ground *H*	Length of Sections			Outside Diameter and Thickness of Sections			Approx Weight of Pole	Breaking Load	Crippling Load	Working Load		Load for Permanent Set not Exceeding 13 mm	Load for Temporary Deflection of 157·5 mm
					Bottom h_3	Middle h_2	Top h_1	Bottom	Middle	Top				Col 14 2	Col 13 2·5		
(1)	(2) (m)	(3) (m)	(4) (m)	(5) (m)	(6) (m)	(7) (m)	(8) (m)	(9) (mm)	(10) (mm)	(11) (mm)	(12) (kg)	(13) N(kgf)	(14) N(kgf)	(15) N(kgf)	(16) N(kgf)	(17) N(kgf)	(18) N(kgf)
540 SP-1	7·00	1·25	0·30	5·75	4·00	1·50	1·50	114·3×3·65	88·9×3·25	76·1×3·25	62·0	3 360 (343)	2 390 (244)	1 200 (122)	1 340 (137)	1 640 (167)	785 (80)
540 SP-2	7·00	1·25	0·30	5·75	4·00	1·50	1·50	114·3×4·50	88·9×4·05	76·1×3·25	73·0	4 060 (414)	2 880 (294)	1 440 (147)	1 630 (166)	1 970 (201)	941 (96)
540 SP-3	7·00	1·25	0·30	5·75	4·00	1·50	1·50	114·3×5·40	88·9×4·85	76·1×3·25	85·0	4 750 (484)	3 370 (344)	1 690 (172)	1 900 (194)	2 300 (235)	1 090 (111)
540 SP-4	7·50	1·25	0·30	6·25	4·50	1·50	1·50	114·3×3·65	88·9×3·25	76·1×3·25	67	3 080 (314)	2 190 (223)	1 090 (111)	1 240 (126)	1 500 (153)	628 (64)
540 SP-5	7·50	1·25	0·30	6·25	4·50	1·50	1·50	114·3×4·50	88·9×4·05	76·1×3·25	79	3 720 (379)	2 640 (269)	1 320 (135)	1 490 (152)	1 800 (184)	745 (76)
540 SP-6	7·50	1·25	0·30	6·25	4·50	1·50	1·50	114·3×5·40	88·9×4·85	76·1×3·25	93	4 350 (444)	3 090 (315)	1 550 (158)	1 750 (178)	2 120 (216)	873 (89)
540 SP-7	7·50	1·25	0·30	6·25	4·50	1·50	1·50	139·7×4·50	114·3×3·65	88·9×3·25	97	5 680 (579)	4 030 (411)	2 020 (206)	2 280 (232)	2 760 (281)	1 400 (143)
540 SP-8	7·50	1·25	0·30	6·25	4·50	1·50	1·50	139·7×4·85	114·3×3·65	88·9×3·25	103	6 060 (618)	4 300 (439)	2 150 (219)	2 420 (247)	2 940 (300)	1 480 (151)
540 SP-9	7·50	1·25	0·30	6·25	4·50	1·50	1·50	139·7×5·40	114·3×3·65	88·9×3·25	110	6 680 (681)	4 750 (484)	2 370 (242)	2 670 (272)	3 250 (331)	1 600 (163)
540 SP-10	8·00	1·50	0·30	6·50	4·50	1·75	1·75	114·3×3·65	88·9×3·25	76·1×3·25	70	2 960 (302)	2 090 (214)	1 050 (107)	1 190 (121)	1 440 (147)	520 (53)
540 SP-11	8·00	1·50	0·30	6·50	4·50	1·75	1·75	114·3×4·50	88·9×4·05	76·1×3·25	83	3 620 (369)	2 570 (262)	1 280 (131)	1 450 (148)	1 760 (179)	619 (63)
540 SP-12	8·00	1·50	0·30	6·50	4·50	1·75	1·75	114·3×5·40	88·9×4·85	76·1×3·25	97	4 180 (426)	2 960 (302)	1 480 (151)	1 670 (170)	2 030 (207)	726 (74)
540 SP-13	8·00	1·50	0·30	6·50	4·50	1·75	1·75	139·7×4·50	114·3×3·65	88·9×3·25	101	5 440 (555)	3 860 (394)	1 930 (197)	2 180 (222)	2 650 (270)	1 180 (120)
540 SP-14	8·00	1·50	0·30	6·50	4·50	1·75	1·75	139·7×4·85	114·3×4·50	88·9×3·25	111	5 820 (593)	4 130 (421)	2 070 (211)	2 320 (237)	2 820 (288)	1 280 (131)
540 SP-15	8·00	1·50	0·30	6·50	4·50	1·75	1·75	139·7×5·40	114·3×4·50	88·9×3·25	119	6 410 (654)	4 550 (464)	2 280 (232)	2 570 (262)	3 120 (318)	1 370 (140)
540 SP-16	8·50	1·50	0·30	7·00	5·00	1·75	1·75	114·3×3·65	88·9×3·25	76·1×3·25	75	2 740 (279)	1 940 (198)	971 (99)	1 100 (112)	1 330 (136)	431 (44)
540 SP-17	8·50	1·50	0·30	7·00	5·00	1·75	1·75	114·3×4·50	88·9×4·05	76·1×3·25	89	3 300 (337)	2 340 (239)	1 180 (120)	1 320 (135)	1 610 (164)	510 (52)
540 SP-18	8·50	1·50	0·30	7·00	5·00	1·75	1·75	114·3×5·40	88·9×4·85	76·1×3·25	104	3 860 (394)	2 750 (280)	1 370 (140)	1 550 (158)	1 870 (191)	598 (61)
540 SP-19	8·50	1·50	0·30	7·00	5·00	1·75	1·75	139·7×4·50	114·3×3·65	88·9×3·25	109	5 040 (514)	3 580 (365)	1 780 (182)	2 020 (206)	2 450 (250)	961 (98)
540 SP-20	8·50	1·50	0·30	7·00	5·00	1·75	1·75	139·7×4·85	114·3×3·65	88·9×3·25	115	5 380 (549)	3 820 (390)	1 910 (195)	2 160 (220)	2 620 (267)	1 010 (103)
540 SP-21	8·50	1·50	0·30	7·00	5·00	1·75	1·75	139·7×5·40	114·3×4·50	88·9×3·25	129	5 930 (605)	4 220 (430)	2 110 (215)	2 370 (242)	2 880 (294)	1 130 (115)
540 SP-22	8·50	1·50	0·30	7·00	5·00	1·75	1·75	165·1×4·50	139·7×4·50	114·3×3·65	141	7 140 (728)	5 070 (517)	2 530 (258)	2 850 (291)	3 570 (354)	1 730 (176)
540 SP-23	8·50	1·50	0·30	7·00	5·00	1·75	1·75	165·1×4·85	139·7×4·50	114·3×3·65	148	7 650 (780)	5 430 (554)	2 720 (277)	3 060 (312)	3 720 (379)	1 820 (186)
540 SP-24	8·50	1·50	0·30	7·00	5·00	1·75	1·75	165·1×5·40	139·7×4·50	114·3×3·65	158	8 450 (862)	6 000 (612)	3 000 (306)	3 380 (345)	4 110 (419)	1 970 (201)
540 SP-25	9·00	1·50	0·30	7·50	5·00	2·00	2·00	114·3×3·65	88·9×3·25	76·1×3·25	78	2 550 (260)	1 810 (185)	902 (92)	1 020 (104)	1 240 (126)	333 (34)
540 SP-26	9·00	1·50	0·30	7·50	5·00	2·00	2·00	114·3×4·50	88·9×4·05	76·1×3·25	92	3 070 (313)	2 180 (222)	1 090 (111)	1 230 (125)	1 490 (152)	402 (41)
540 SP-27	9·00	1·50	0·30	7·50	5·00	2·00	2·00	114·3×5·40	88·9×4·85	76·1×3·25	108	3 600 (367)	2 560 (261)	1 280 (130)	1 440 (147)	1 750 (178)	461 (47)

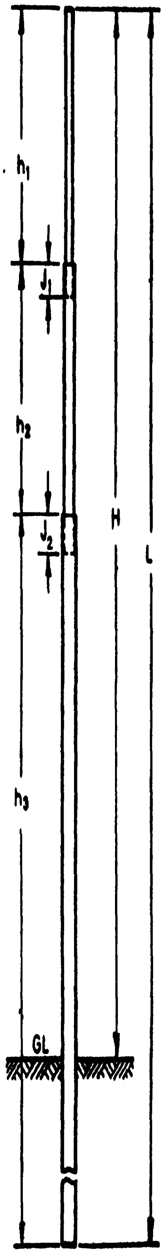
1 kgf=9·806 65 N.



(*Continued*)

TABLE 2 SWAGED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 540 MPa (55 kgf/mm²) — *Contd*.

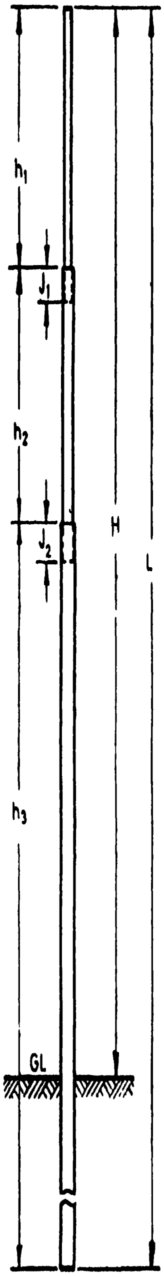
DESIGNATION	OVERALL LENGTH *L*	PLANTING DEPTH	LOAD APPLIED FROM TOP AT A DISTANCE	HEIGHT ABOVE GROUND *H*	LENGTH OF SECTIONS Bottom h_3	Middle h_2	Top h_1	OUTSIDE DIAMETER AND THICKNESS OF SECTIONS Bottom	Middle	Top	APPROX WEIGHT OF POLE	BREAKING LOAD	CRIPPLING LOAD	WORKING LOAD Col 14 / 2	Col 13 / 2·5	LOAD FOR PERMANENT SET NOT EXCEEDING 13 mm	LOAD FOR TEMPORARY DEFLECTION OF 157·5 mm
(1)	(2) (m)	(3) (m)	(4) (m)	(5) (m)	(6) (m)	(7) (m)	(8) (m)	(9) (mm)	(10) (mm)	(11) (mm)	(12) (kg)	(13) N(kgf)	(14) N(kgf)	(15) N(kgf)	(16) N(kgf)	(17) N(kgf)	(18) N(kgf)
540 SP-28	9·00	1·50	0·30	7·50	5·00	2·00	2·00	139·7×4·50	114·3×3·65	88·9×3·25	113	4 690 (478)	3 320 (339)	1 670 (170)	1 870 (191)	2 280 (232)	745 (76)
540 SP-29	9·00	1·50	0·30	7·50	5·00	2·00	2·00	139·7×4·85	114·3×4·50	88·9×3·25	125	5 010 (511)	3 560 (363)	1 780 (181)	2 000 (204)	2 430 (248)	814 (83)
540 SP-30	9·00	1·50	0·30	7·50	5·00	2·00	2·00	139·7×5·40	114·3×4·50	88·9×3·25	133	5 520 (563)	3 920 (400)	1 960 (200)	2 210 (225)	2 690 (274)	883 (90)
540 SP-31	9·00	1·50	0·30	7·50	5·00	2·00	2·00	165·1×4·50	139·7×4·50	114·3×3·65	147	6 650 (678)	4 720 (481)	2 360 (241)	2 660 (271)	3 240 (330)	1 360 (139)
540 SP-32	9 00	1·40	0·30	7·50	5·00	2·00	2·00	165·1×4·85	139·7×4·50	114·3×3·65	154	7 120 (726)	5 050 (515)	2 530 (258)	2 840 (290)	3 460 (353)	1 430 (146)
540 SP-33	9 00	1·40	0·30	7·50	5·00	2·00	2·00	165·1×5·40	139·7×4·50	114·3×3·65	164	7 860 (802)	5 580 (569)	2 800 (285)	3 150 (321)	3 820 (390)	1 540 (157)
540 SP-34	9·50	1·80	0·60	7·70	5·00	2·25	2·25	139·7×4·50	114·3×4·50	88·9×3·25	122	4 760 (485)	3 370 (344)	1 690 (172)	1 900 (194)	2 310 (236)	745 (76)
540 SP-35	9·50	1·80	0·60	7·70	5·00	2·25	2·25	139·7×4·85	114·3×4·50	88·9×3·25	129	5 080 (518)	3 610 (368)	1 800 (184)	2 030 (207)	2 470 (252)	785 (80)
540 SP-36	9·50	1·80	0·60	7·70	5·00	2·25	2·25	139·7×5·40	114·3×4·50	88·9×3·25	137	5 600 (571)	3 970 (405)	1 990 (203)	2 240 (228)	2 730 (278)	834 (85)
540 SP-37	9 50	1·80	0·60	7·70	5·00	2·25	2·25	165·1×4·50	139·7×4·50	114·3×3·65	153	6 740 (687)	4 790 (488)	2 390 (244)	2 700 (275)	3 280 (334)	1 300 (133)
540 SP-38	9·50	1·80	0·60	7·70	5·00	2·25	2·25	165·1×4·85	139·7×4·50	114·3×3·65	160	7 200 (736)	5 130 (523)	2 560 (261)	2 880 (294)	3 510 (358)	1 370 (140)
540 SP-39	9 50	1·80	0·60	7·70	5·00	2·25	2·25	165·1×5·40	139·7×4·50	114·3×3·65	170	7 970 (813)	5 660 (577)	2 830 (289)	3 190 (325)	3 870 (395)	1 480 (151)
540 SP-40	10·00	1·80	0·60	8·20	5·20	2·40	2·40	139·7×4·50	114·3×4·50	88·9×3·25	128	4 440 (453)	3 160 (322)	1 580 (161)	1 780 (181)	2 160 (220)	608 (62)
540 SP-41	10·00	1·80	0·60	8·20	5·20	2·40	2·40	139·7×4·85	114·3×4·50	88·9×3·25	135	4 750 (484)	3 370 (344)	1 690 (172)	1 900 (194)	2 300 (235)	637 (65)
540 SP-42	10·00	1·80	0·60	8·20	5·20	2·40	2·40	139·7×5·40	114·3×4·50	88·9×3·25	144	5 230 (533)	3 710 (378)	1 850 (189)	2 090 (213)	2 540 (259)	677 (69)
540 SP-43	10·00	1·80	0·60	8·20	5·20	2·40	2·40	165·1×4·50	139·7×4·50	114·3×3·65	160	6 300 (642)	4 470 (456)	2 240 (228)	2 520 (257)	3 060 (312)	1 060 (108)
540 SP-44	10·00	1·80	0·60	8·20	5·20	2·40	2·40	165·1×4·85	139·7×4·50	114·3×3·65	168	6 750 (688)	4 790 (488)	2 390 (244)	2 700 (275)	3 280 (334)	1 120 (114)
540 SP-45	10·00	1·80	0·60	8·20	5·20	2·40	2·40	165·1×5·40	139·7×4·50	114·3×3·65	178	7 450 (760)	5 300 (540)	2 650 (270)	2 980 (304)	3 620 (369)	1 200 (122)
540 SP-46	10·00	1·80	0·60	8·20	5·20	2·40	2·40	193·7×4·85	165·1×4·50	139·7×4·50	208	9 440 (963)	6 710 (684)	3 350 (342)	3 780 (385)	4 590 (468)	1 850 (189)
540 SP-47	10·00	1·80	0·60	8·20	5·20	2·40	2·40	193·7×5·40	165·1×4·50	139·7×4·50	221	10 400 (1 057)	7 350 (750)	3 680 (375)	4 150 (423)	5 040 (514)	1 990 (203)
540 SP-48	10·00	1·80	0·60	8·20	5·20	2·40	2·40	193·7×5·90	165·1×4·50	139·7×4·50	233	11 300 (1 151)	8 010 (817)	4 010 (409)	4 510 (460)	5 480 (559)	2 110 (215)
540 SP-19	11·00	1·80	0·60	9·20	5·60	2·70	2·70	139·7×4·50	114·3×4·50	88·9×3·25	140	3 920 (400)	2 790 (284)	1 390 (142)	1 570 (160)	1 900 (194)	412 (42)
540 SP-50	11·00	1·80	0·60	9·20	5·60	2·70	2·70	139·7×4·85	114·3×4·50	88·9×3·25	147	4 200 (428)	2 980 (304)	1 490 (152)	1 680 (171)	2 040 (208)	431 (44)
540 SP-51	11·00	1·80	0·60	9·20	5·60	2·70	2·70	139·7×5·40	114·3×5·40	88·9×3·25	164	4 620 (471)	3 280 (334)	1 640 (167)	1 840 (188)	2 250 (229)	480 (49)
540 SP-52	11·00	1·80	0·60	9·20	5·60	2·70	2·70	165·1×4·50	139·7×4·50	114·3×3·65	175	5 560 (567)	3 950 (403)	1 970 (201)	2 230 (227)	2 710 (276)	726 (74)
540 SP-53	11·00	1·80	0·60	9·20	5·60	2·70	2·70	165·1×4·85	139·7×4·50	114·3×3·65	183	5 960 (608)	4 240 (432)	2 120 (216)	2 380 (243)	2 890 (295)	765 (78)
540 SP-54	11·00	1·80	0·60	9·20	5·60	2·70	2·70	165·1×5·40	139·7×4·50	114·3×3·65	194	6 590 (672)	4 680 (477)	2 340 (239)	2 640 (269)	3 210 (327)	814 (83)
540 SP-55	11·00	1·80	0·60	9·20	5·60	2·70	2·70	193·7×4·85	165·1×4·50	139·7×4·50	227	8 340 (851)	5 920 (604)	2 960 (302)	3 330 (340)	4 060 (414)	1 270 (130)



(*Continued*)

TABLE 2 SWAGED POLES MADE FROM STEEL OF ULTIMATE TENSILE STRENGTH 540 MPa (55 kgf/mm²) — *Contd*

DESIGNATION	OVER-ALL LENGTH *L*	PLANTING DEPTH	LOAD APPLIED FROM TOP AT A DISTANCE	HEIGHT ABOVE GROUND *H*	LENGTH OF SECTIONS Bottom *h*₃	Middle *h*₂	Top *h*₁	OUTSIDE DIAMETER AND THICKNESS OF SECTIONS Bottom	Middle	Top	APPROX WEIGHT OF POLE	BREAKING LOAD	CRIPPLING LOAD	WORKING LOAD Col 14/2	Col 13/2·5	LOAD FOR PERMANENT SET NOT EXCEEDING 13 mm	LOAD FOR TEMPORARY DEFLECTION OF 157·5 mm
(1)	(2) (m)	(3) (m)	(4) (m)	(5) (m)	(6) (m)	(7) (m)	(8) (m)	(9) (mm)	(10) (mm)	(11) (mm)	(12) (kg)	(13) N(kgf)	(14) N(kgf)	(15) N(kgf)	(16) N(kgf)	(17) N(kgf)	(18) N(kgf)
540 SP-56	11·00	1·80	0·60	9·20	5·60	2·70	2·70	193·7×5·40	165·1×4·50	139·7×4·50	241	9 160 (934)	6 500 (663)	3 260 (332)	3 670 (374)	4 450 (454)	1 370 (140)
540 SP-57	11·00	1·80	0·60	9·20	5·60	2·70	2·70	193·7×5·90	165·1×4·85	139·7×4·50	256	9 970 (1 017)	7 080 (722)	3 540 (361)	3 990 (407)	4 840 (494)	1 470 (150)
540 SP-58	12·00	2·00	0·60	10·00	5·80	3·10	3·10	165·1×4·50	139·7×4·50	114·3×3·65	186	5 090 (519)	3 610 (368)	1 800 (184)	2 040 (208)	2 470 (252)	539 (55)
540 SP-59	12·00	2·00	0·60	10·00	5·80	3·10	3·10	165·1×4·85	139·7×4·50	114·3×3·65	197	5 450 (556)	3 870 (395)	1 930 (197)	2 180 (222)	2 650 (270)	569 (58)
540 SP-60	12·00	2·00	0·60	10·00	5·80	3·10	3·10	165·1×5·40	139·7×4·50	114·3×3·65	208	6 020 (614)	4 280 (436)	2 140 (218)	2 410 (246)	2 920 (298)	598 (61)
540 SP-61	12·00	2·00	0·60	10·00	5·80	3·10	3·10	193·7×4·85	165·1×4·50	139·7×4·50	245	7 630 (778)	5 410 (552)	2 710 (276)	3 050 (311)	3 710 (378)	951 (97)
540 SP-62	12·00	2·00	0·60	10·00	5·80	3·10	3·10	193·7×5·40	165·1×4·50	139·7×4·50	259	8 370 (854)	5 940 (606)	2 970 (303)	3 350 (342)	4 070 (415)	1 010 (103)
540 SP-63	12·00	2·00	0·60	10·00	5·80	3·10	3·10	193·7×5·90	165·1×4·85	139·7×4·50	277	9 120 (930)	6 470 (660)	3 240 (330)	3 650 (372)	4 430 (452)	1 090 (111)
540 SP-64	12·00	2·00	0·60	10·00	5·80	3·10	3·10	219·1×4·85	193·7×4·85	165·1×4·50	292	9 820 (1 001)	6 970 (711)	3 480 (355)	3 920 (400)	4 770 (486)	1 460 (149)
540 SP-65	12·00	2·00	0·60	10·00	5·80	3·10	3·10	219·1×5·60	193·7×4·85	165·1×4·50	313	11 200 (1 141)	7 940 (810)	3 970 (405)	4 470 (456)	5 440 (555)	1 610 (164)
540 SP-66	12·00	2·00	0·60	10·00	5·80	3·10	3·10	219·1×5·90	193·7×4·85	165·1×4·50	322	11 800 (1 199)	8 340 (851)	4 180 (426)	4 710 (480)	5 720 (583)	1 660 (169)
540 SP-67	13·00	2·00	0·60	11·00	5·80	3·60	3·60	193·7×4·85	165·1×4·50	139·7×4·50	261	6 890 (703)	4 890 (499)	2 450 (250)	2 760 (281)	3 350 (342)	677 (69)
540 SP-68	13·00	2·00	0·60	11·00	5·80	3·60	3·60	193·7×5·40	165·1×4·85	139·7×4·50	281	7 570 (772)	5 370 (548)	2 690 (274)	3 030 (309)	3 680 (375)	735 (75)
540 SP-69	13·00	2·00	0·60	11·00	5·80	3·60	3·60	193·7×5·90	165·1×5·40	139·7×4·50	302	8 250 (841)	5 850 (597)	2 930 (299)	3 300 (336)	4 010 (409)	794 (81)
540 SP-70	13·00	2·00	0·60	11·00	5·80	3·60	3·60	219·1×4·85	193·7×4·85	165·1×4·50	312	8 870 (904)	6 300 (642)	3 150 (321)	3 550 (362)	4 310 (439)	1 060 (108)
540 SP-71	13·00	2·00	0·60	11·00	5·80	3·60	3·60	219·1×5·60	193·7×4·85	165·1×4·50	333	10 100 (1 031)	7 180 (732)	3 590 (366)	4 040 (412)	4 910 (501)	1 160 (118)
540 SP-72	13·00	2·00	0·60	11·00	5·80	3·60	3·60	219·1×5·90	193·7×4·85	165·1×4·50	343	10 600 (1 084)	7 550 (770)	3 780 (385)	4 260 (434)	5 170 (527)	1 190 (121)
540 SP-73	14·50	2·00	0·60	12·50	6·50	4·00	4·00	193·7×5·40	165·1×4·85	139·7×4·50	312	6 620 (675)	4 700 (479)	2 350 (240)	2 650 (270)	3 220 (328)	500 (51)
540 SP-74	14·50	2·00	0·60	12·50	6·50	4·00	4·00	193·7×5·90	165·1×5·40	139·7×4·50	336	7 210 (735)	5 120 (522)	2 560 (261)	2 880 (294)	3 500 (357)	539 (55)
540 SP-75	14·50	2·00	0·60	12·00	6·50	4·00	4·00	219·1×5·60	193·7×4·85	165·1×4·50	370	8 840 (901)	6 280 (640)	3 140 (320)	3 530 (360)	4 300 (438)	775 (79)
540 SP-76	14·50	2·00	0·60	12·50	6·50	4·00	4·00	219·1×5·90	193·7×4·85	165·1×4·50	380	9 290 (947)	6 590 (672)	3 300 (336)	3 720 (379)	4 510 (460)	794 (81)
540 SP-77	16·00	2·00	0·60	13·70	7·00	4·50	4·50	193·7×5·40	165·1×4·85	139·7×4·50	341	6 010 (613)	4 270 (435)	2 140 (218)	2 400 (245)	2 920 (298)	363 (37)
540 SP-78	16·00	2·00	0·60	13·70	7·00	4·50	4·50	193·7×5·90	165·1×5·40	139·7×4·50	367	6 550 (668)	4 650 (474)	2 320 (237)	2 620 (267)	3 190 (325)	392 (40)
540 SP-79	16·00	2·00	0·60	13·70	7·00	4·50	4·50	219·1×5·60	193·7×4·85	165·1×4·50	405	8 030 (819)	5 700 (581)	2 850 (291)	3 200 (328)	3 900 (398)	569 (58)
540 SP-80	16·00	2·00	0·60	13·70	7·00	4·50	4·50	219·1×5·90	193·7×4·85	165·1×4·50	416	8 440 (861)	5 990 (611)	3 000 (306)	3 370 (344)	4 100 (418)	588 (60)



NOTE 1 — Based on assumptions that steel weighs 7·85 g/cm³.

NOTE 2 — Before making a selection of pole it is necessary to assume a suitable factor of safety which has to be applied on breaking load or the crippling load of the pole as the case may be depending on the relevant electricity rules to obtain the working load of the pole. Values of working load of the poles with a factor of safety 2 on crippling load and factor 2·5 on breaking load are both given in Table 1 for information. The user will have to calculate the working loads if different factors of safety other than those stated above are applied.

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